

## ВІДПОВІДІ ДО ЗАВДАНЬ ДЛЯ САМОСТІЙНОЇ РОБОТИ

### РОЗДІЛ 1:

**1.1.** а)  $\begin{pmatrix} 6 & 0 \\ 11 & \end{pmatrix}$ , б)  $\begin{pmatrix} -4 & -8 \\ -16 & 4 \end{pmatrix}$ , в)  $\begin{pmatrix} 1 & 4 \\ 2 & -1 \end{pmatrix}$ , г)  $\begin{pmatrix} 19 & -8 \\ 13 & -5 \end{pmatrix}$ , д)  $\begin{pmatrix} -3 & 12 \\ -5 & 17 \end{pmatrix}$ ,

е)  $\begin{pmatrix} 9 & 0 \\ 0 & 9 \end{pmatrix}$ ; **1.2.**  $A \cdot B = \begin{pmatrix} -5 & -23 & -16 \\ 5 & 4 & -2 \\ -21 & -51 & -24 \end{pmatrix}$ ,  $\hat{A} \cdot \hat{A} = \begin{pmatrix} -12 & 19 \\ 25 & -13 \end{pmatrix}$ ; **1.3.**

а)  $\begin{pmatrix} 6,5 & 23 \\ 10 & 13,5 \end{pmatrix}$ , б)  $\begin{pmatrix} 185 & 24 \\ -66 & -3 \end{pmatrix}$ , в)  $\begin{pmatrix} 34 & 214 \\ 34 & 134 \end{pmatrix}$ ; **1.4.** а)  $\begin{pmatrix} 1 & 8 & 10 \\ 2 & -4 & 4 \\ 6 & 2 & 3 \end{pmatrix}$ , б)

$\begin{pmatrix} 0 & 12 & -4 \\ -4 & 16 & -8 \\ -8 & 4 & 8 \end{pmatrix}$ , в)  $\begin{pmatrix} 0 & 1 & 2 \\ -3 & -4 & -1 \\ 1 & 2 & -2 \end{pmatrix}$ , г)  $\begin{pmatrix} 1 & 3 & -1 \\ 5 & 15 & 5 \\ -8 & 16 & 6 \end{pmatrix}$ , д)  $\begin{pmatrix} 29 & -56 & 5 \\ 4 & -5 & -3 \\ 13 & -29 & 0 \end{pmatrix}$ ,

е)  $\begin{pmatrix} -1 & -11 & -12 \\ 0 & 11 & -11 \\ -5 & 0 & 5 \end{pmatrix}$ ; **1.5.** а)  $\begin{pmatrix} -2,5 & 5 & -4 \\ 8,5 & 12,5 & -9 \\ 4 & 3,5 & 3,5 \end{pmatrix}$ , б)  $\begin{pmatrix} 31 & 8 & -22 \\ -7 & 53 & 26 \\ -22 & -7 & 19 \end{pmatrix}$ , в)

$\begin{pmatrix} 38 & 8 & -14 \\ 66 & 66 & -37 \\ 46 & -26 & 26 \end{pmatrix}$ ; **1.6.** *формули скороченого множення не справджуються.*

**1.7.**  $\begin{pmatrix} 20 & -36 \\ -9 & 29 \end{pmatrix}$ ; **1.8.**  $\begin{pmatrix} -4894 & -3589 \\ 2035 & 5079 \end{pmatrix}$ ; **1.9.**  $\begin{pmatrix} 14 & -32 & -11 \\ -16 & 36 & -7 \\ -2 & 16 & -10 \end{pmatrix}$ ; **1.10.**

$\begin{pmatrix} 21 & -3 & 28 \\ -13 & 1 & -3 \\ 7 & -13 & 4 \end{pmatrix}$ ; **1.11.**  $\begin{pmatrix} -5 & -9 \\ 3 & -16 \end{pmatrix}$ ; **1.12.**  $\begin{pmatrix} -22 & 19 \\ -9 & -8 \end{pmatrix}$ ; **1.13.**  $\begin{pmatrix} -45 & 14 \\ 20 & 9 \end{pmatrix}$ ;

**1.14.**  $\begin{pmatrix} -93 & 35 \\ 36 & -20 \end{pmatrix}$ ; **1.15.**  $\begin{pmatrix} -9 & -55 \\ 34 & -70 \end{pmatrix}$ ; **1.16.**  $\begin{pmatrix} 4 & -26 & -58 \\ 25 & 34 & 44 \\ 16 & 42 & 26 \end{pmatrix}$ ; **1.17.**

$$\begin{pmatrix} 21 & 10 \\ 5 & 78 \end{pmatrix}; \mathbf{1.18.} \begin{pmatrix} -6 & 7 & 23 \\ -14 & 56 & 79 \\ 34 & -1 & -83 \end{pmatrix}; \mathbf{1.19.} -64; \mathbf{1.20.} 9; \mathbf{1.21.} 58; \mathbf{1.22.} -22; \mathbf{1.23.}$$

$\mathbf{29.} \mathbf{1.24.} 26; \mathbf{1.25.} 19; \mathbf{1.26.} 120; \mathbf{1.27.} 133; \mathbf{1.28.} 0; \mathbf{1.29.} 256; \mathbf{1.30.} 149; \mathbf{1.31.} -86; \mathbf{1.32.} -9; \mathbf{1.33.} 27; \mathbf{1.34.} 245; \mathbf{1.35.} 174; \mathbf{1.36.} -809; \mathbf{1.37.} -18; \mathbf{1.38.} 32; \mathbf{1.43.} -129; \mathbf{1.44.} 232; \mathbf{1.45.} 15; \mathbf{1.46.} -212; \mathbf{1.47.} -39; \mathbf{1.48.} 112; \mathbf{1.49.} 2; \mathbf{1.50.} 2; \mathbf{1.51.} 2;$

$$\mathbf{1.52.} 3; \mathbf{1.53.} 2; \mathbf{1.54.} 2; \mathbf{1.55.} 3; \mathbf{1.56.} 3; \mathbf{1.57.} 3; \mathbf{1.58.} 2; \mathbf{1.59.} \begin{pmatrix} -2 & 1 \\ 1,5 & -0,5 \end{pmatrix};$$

$$\mathbf{1.60.} \begin{pmatrix} -0,5 & 0,4 \\ 0 & 0,2 \end{pmatrix}; \mathbf{1.61.} \begin{pmatrix} 1 & 1 & -1 \\ 5 & 4 & -7 \\ -3 & -2 & 4 \end{pmatrix}; \mathbf{1.62.} \begin{pmatrix} -1,25 & -0,25 & 0,5 \\ -2,25 & -0,25 & 0,5 \\ 1,75 & 0,75 & -0,5 \end{pmatrix}; \mathbf{1.63.}$$

$$\begin{pmatrix} 0,6 & -0,1 & 0,4 \\ 0,1 & 0,4 & -0,1 \\ -0,1 & 0,1 & 0,1 \end{pmatrix}; \mathbf{1.56.} \begin{pmatrix} 0,25 & 0,25 & -0,125 \\ -2,25 & 4,25 & 3,625 \\ 0,75 & 1,75 & -1,375 \end{pmatrix}; \mathbf{1.65.}$$

$$\begin{pmatrix} 0,3 & 0,25 & -0,2 \\ 0,2 & 0 & 0,2 \\ -0,3 & 0,25 & 0,2 \end{pmatrix}; \mathbf{1.66.} \begin{pmatrix} 2 & -2 & 1 \\ 1 & 1 & -2 \\ -1 & 0 & 1 \end{pmatrix}; \mathbf{1.67.} \begin{pmatrix} 0,6 & -0,4 & 0,2 \\ 2 & 0 & -1 \\ -0,8 & 0,2 & 0,4 \end{pmatrix}; \mathbf{1.68.}$$

$$\begin{pmatrix} 0,85 & -0,2 & 0,25 \\ 0,7 & -0,4 & 0,5 \\ -0,45 & 0,4 & 0,25 \end{pmatrix}; \mathbf{1.69.} \begin{pmatrix} 9,8 & 0,2 \\ -0,2 & 0,2 \end{pmatrix}; \mathbf{1.70.} \begin{pmatrix} 0,6 & 0,2 \\ 9,2 & 3,4 \end{pmatrix}; \mathbf{1.71.}$$

$$\begin{pmatrix} 3 & -3 \\ -1,6 & -1,8 \end{pmatrix}; \mathbf{1.72.} \begin{pmatrix} 1,5 & 5 \\ -0,25 & 6 \end{pmatrix}; \mathbf{1.73.} \begin{pmatrix} 1,6 & -0,8 \\ 1,6 & 0,2 \end{pmatrix}; \mathbf{1.74.} \begin{pmatrix} 1,3 & -3 \\ -0,8 & 5 \end{pmatrix}; \mathbf{1.75.}$$

$$\begin{pmatrix} 0,4 & -0,2 \\ 2 & -1 \end{pmatrix}; \mathbf{1.76.} \begin{pmatrix} 0,2 & 0,2 \\ 0,2 & -0,8 \end{pmatrix}; \mathbf{1.77.} \begin{pmatrix} -1 & -5 & 7 \\ -0,5 & -4 & 4,5 \\ -1 & -4 & 6 \end{pmatrix}; \mathbf{1.78.}$$

$$\begin{pmatrix} -0,5 & 1 & 3 \\ 0,25 & 0 & 4,5 \\ 0,75 & 1,5 & 2 \end{pmatrix}; \mathbf{1.79.} \begin{pmatrix} 0,5 & 0,5 & 0 \\ -0,5 & -0,5 & 1 \\ 0 & -0,5 & 0,5 \end{pmatrix}; \mathbf{1.80.} \text{ не існує}; \mathbf{1.81.}$$

$$\left\{\frac{41}{46}; \frac{58}{46}; \frac{38}{46}\right\}; \mathbf{1.82.} \left\{\frac{77}{63}; -\frac{28}{63}; -\frac{140}{63}\right\}; \mathbf{1.83.} \{-1; -2; -4\}; \mathbf{1.84.} \{2; 0; -1\}; \mathbf{1.85.}$$

$$\{3; 1; -1\}; \mathbf{1.86.} \{4; 2; 1\}; \mathbf{1.87.} \left\{-\frac{13}{8}; -\frac{2}{8}; -\frac{5}{8}\right\}; \mathbf{1.88.} \left\{\frac{20}{17}; \frac{16}{17}; -\frac{55}{17}\right\}; \mathbf{1.89.} \{4;$$

$$0,9; 1,4\}; \mathbf{1.90.} \left\{\frac{18}{19}; \frac{4}{19}; \frac{78}{19}\right\}; \mathbf{1.91.} \{1; 1; 1\}; \mathbf{1.92.} \{-3; -5; -4\}; \mathbf{1.95.}$$

$$\left(0; x_2; \frac{9}{7} + x_2; \frac{1}{7}\right); \mathbf{1.96.} \left(-\frac{5}{17}; \frac{23}{17}\right); \mathbf{1.97.} \text{ система несумісна}; \mathbf{1.98.} \text{ система}$$

$$\text{несумісна}; \mathbf{1.99.} \left(\frac{5}{4} + \frac{1}{4}x_3 - \frac{3}{4}x_4 - x_5; -\frac{1}{4} + \frac{7}{4}x_3 + \frac{7}{4}x_4; 0; 0; 0\right); \mathbf{1.100.} (1; -1); \mathbf{1.102.}$$

$$\left(\frac{30}{41}; -\frac{53}{41}; -\frac{5}{41}\right).$$

## РОЗДІЛ 2:

$$\mathbf{2.1.} \{-3; -11; 6\}; \mathbf{2.2.} \{10; -13; 21\}, \sqrt{734}; \mathbf{2.3.} \text{можуть}; \mathbf{2.4.} (4; 1; 1); \mathbf{2.5.}$$

$$\{-5; 0\}; \mathbf{2.6.} \sqrt{2+\sqrt{2}}, \sqrt{2-\sqrt{2}}; \mathbf{2.7.} \sqrt{13+\sqrt{3}}, \sqrt{13-\sqrt{3}}; \mathbf{2.8.} 7, \sqrt{51}; \mathbf{2.9.} 20;$$

$$\mathbf{2.10.} 13; \mathbf{2.11.} \overrightarrow{AB} = \frac{\vec{a}}{2} - \frac{\vec{b}}{2}, \overrightarrow{BC} = \frac{\vec{a}}{2} + \frac{\vec{b}}{2}, \overrightarrow{CD} = \frac{\vec{a}}{2} + \frac{\vec{b}}{2}, \overrightarrow{DA} = \frac{\vec{a}}{2} - \frac{\vec{b}}{2}; \mathbf{2.14.}$$

$$np_a \vec{b} = \frac{20}{3}, np_b \vec{a} = \frac{20}{7}; \mathbf{2.16.} -4; \mathbf{2.18.} |\vec{a}| = 70; \mathbf{2.21.} \{-1; -2; -4\}; \mathbf{2.22.} \{2; 0; -$$

$$1\}; \mathbf{2.23.} \{3; 1; -1\}; \mathbf{2.24.} \{4; 2; 1\}; \mathbf{2.25.} \{1; 1; 1\}; \mathbf{2.26.} -4; -2; 6; 10; \mathbf{2.27.} 2\sqrt{2};$$

$$\mathbf{2.28.} -4; \mathbf{2.29.} 9; \mathbf{2.30.} 60^\circ; \mathbf{2.31.} \arccos \frac{17}{50}; \mathbf{2.32.} \arccos -\frac{7\sqrt{3}}{27}; \mathbf{2.33.} 9; \mathbf{2.34.} 6;$$

$$\mathbf{2.35.} -2; \mathbf{2.36.} \frac{13}{3}; \mathbf{2.38.} (-2 \quad -6 \quad -8); \mathbf{2.39.} \frac{26}{6}; \mathbf{2.41.} \text{не компланарні}; \mathbf{2.42.}$$

компланарні.

## РОЗДІЛ 3:

$$\mathbf{3.1.} M \in y, P \in y; \mathbf{3.2.} \text{ а) } y = \frac{3}{4}x + 3, \text{ б) } \frac{x}{-4} + \frac{y}{3} = 1; \mathbf{3.3.} 3x - y - 4 = 0,$$

$$3x + 2y - 1 = 0, 3x + 5y - 34 = 0; \mathbf{3.4.} \arctg \frac{8}{9}, \arctg \frac{4}{3}, \arctg 12; \mathbf{3.5.} 12 \text{ кв. од.}$$

- 3.6.**  $3x - 4y + 14 = 0$ ; **3.7.**  $7x + 3y - 32 = 0$ ; **3.8.** 1)  $2x + 3y - 7 = 0$ , 2)  $3x - 2y - 4 = 0$ ; **3.9.** 5 од. **3.10.** (11; -11); **3.11.** (10; -5); **3.12.** (-2; -3); **3.13.** а) 15; 20; 25; б)  $3x + 4y - 20 = 0$ ;  $4x - 3y + 15 = 0$ ;  $7x - 24y - 180 = 0$ ; в)  $24x + 7y - 35 = 0$ ; г) 12 од. д)  $x + 18y + 60 = 0$ ; е) (2,47; -3,47); ж)  $\arctg \frac{3}{4}$ ; з) 150 кв. од. **3.14.**  $(x-2)^2 + (y+3)^2 = 36$ ; **3.15.**  $(x+1)^2 + (y-2)^2 = 25$ ; **3.16.**  $\left(x + \frac{4}{3}\right)^2 + \left(y + \frac{5}{3}\right)^2 = \frac{65}{9}$ ; **3.17.**  $(x-2)^2 + (y-1)^2 = 25$ ; **3.18.**  $(x-1)^2 + (y-4)^2 = 8$ ; **3.19.** 1)  $\frac{x^2}{25} + \frac{y^2}{9} = 1$ , 2)  $\frac{x^2}{169} + \frac{y^2}{144} = 1$ , 3)  $\frac{x^2}{25} + \frac{y^2}{16} = 1$ , 4)  $\frac{x^2}{100} + \frac{y^2}{64} = 1$ , 5)  $\frac{x^2}{169} + \frac{y^2}{25} = 1$ ; **3.20.** 1)  $\frac{x^2}{9} - \frac{y^2}{16} = 1$ , 2)  $\frac{x^2}{4} - \frac{y^2}{5} = 1$ , 3)  $\frac{x^2}{64} - \frac{y^2}{36} = 1$ , 4)  $\frac{x^2}{36} - \frac{y^2}{64} = 1$ , 5)  $\frac{x^2}{32} - \frac{y^2}{8} = 1$ ; **3.21.** 1)  $y^2 = 4x$ , 2)  $y^2 = -9x$ , 3)  $x^2 = y$ , 4)  $x^2 = -2y$ ; **3.22.**  $(x+1)^2 + (y-2)^2 = 25$ , коло,  $r = 4$ , центр (-2; 3); **3.23.**  $(x+2)^2 + 4(y-3)^2 = 1$ , еліпс, центр (-5; -1),  $a = 1$ ,  $b = \frac{1}{2}$ .

#### РОЗДІЛ 4:

- 4.1.** 5; 10;  $3\sqrt{2}$ ; **4.2.** С (6; 1; 19), Д (9; -5; 12); **4.3.**  $\sqrt{30}$ ; **4.4.** 4 од. **4.5.**  $x + y - 4z = 0$ ; **4.6.** (1; -1; 2); **4.7.**  $\sqrt{22}$ ; **4.8.**  $\frac{x-1}{-2} = \frac{y-1}{-3} = \frac{z-1}{-3}$ ,  $\frac{x-1}{-1} = \frac{y-1}{-4} = \frac{z-1}{2}$ ; **4.9.**  $\arccos \frac{8}{\sqrt{2122}} \approx 68^\circ$ ; **4.10.**  $\approx 9,5$  кв. од.; **4.11.**  $18x - 11y - 29 = 0$ ; **4.12.** 3 куб. од..

#### РОЗДІЛ 5:

- 5.1.** 0,5; -4; 0,5; **5.2.**  $\sqrt{5}$ ;  $\sqrt{3}$ ; 0; **5.3.**  $\frac{\pi}{6}$ ;  $\frac{\pi}{2}$ ;  $-\frac{\pi}{6}$ ; **5.4.**  $\frac{1}{2}$ ;  $\frac{\sqrt{2}}{2}$ ; 1; **5.5.** 9; 1; 1,1; **5.6.**  $(-\infty; 0) \cup (0; 1) \cup (1; \infty)$ ; **5.7.**  $\left[-\infty; \frac{5}{2}\right]$ ; **5.8.**  $(-\infty; 1) \cup (1; 2) \cup (2; \infty)$ ; **5.9.**  $(-\infty; 0) \cup (4; \infty)$ ; **5.10.**  $(-\infty; 1) \cup (3; \infty)$ ; **5.11.**  $(-\infty; 1) \cup (2; \infty)$ ; **5.12.** [-4; 4]; **5.13.**

(0;1) ∪ ∪(1;∞); **5.14.** [-1;3); **5.15.** [4]; **5.16.** (-1;0) ∪ (1;2) ∪ (2;∞); **5.17.** [-4;-π] ∪ [0;π]; **5.33.** 0,5; **5.34.** ∞; **5.35.** 0; **5.36.** 1; **5.37.** 0; **5.38.** 0; **5.39.** 1; **5.40.** -0,5; **5.46.** 0; **5.47.** 1; **5.48.** 1; **5.49.** ∞; **5.50.** ∞; **5.51.** 0; **5.52.** ∞; **5.53.** ∞; **5.54.**  $\frac{1}{3}$ ; **5.55.** 2; **5.56.**  $\frac{1}{2}$ ; **5.57.** 0; **5.58.** ∞; **5.59.**  $\frac{1}{2}$ ; **5.60.** 0; **5.61.** 3; **5.62.** ∞; **5.63.** ∞; **5.64.** ∞; **5.65.** 3; **5.66.** 0; **5.67.** 4; **5.68.**  $\frac{5}{4}$ ; **5.69.**  $-\frac{2}{3}$ ; **5.70.**  $\frac{3}{4}$ ; **5.71.** 32; **5.72.** 6; **5.73.** -2; **5.74.**  $\frac{2}{9}$ ; **5.75.** 2; **5.76.**  $\frac{12}{5}$ ; **5.77.** -4; **5.78.** -∞; **5.79.** 4; **5.80.**  $-\frac{\sqrt{3}}{3}$ ; **5.81.**  $-\frac{1}{6}$ ; **5.81.** -1; **5.82.**  $\frac{1}{8}$ ; **5.83.** -∞; **5.84.** -∞; **5.85.** 1; **5.86.** ∞; **5.87.** ∞; **5.88.** -2; **5.89.** 2; **5.90.** 9; **5.91.**  $\frac{5}{4}$ ; **5.92.** 1; **5.93.** -6; **5.94.**  $\frac{8}{5}$ ; **5.95.**  $e^{\frac{1}{5}}$ ; **5.96.**  $e^{-10}$ ; **5.97.**  $e^{-3}$ ; **5.98.**  $e^2$ ; **5.99.**  $e^5$ ; **5.100.**  $2\sqrt{e}$ ; **5.101.**  $\frac{1}{3}$ ; **5.102.**  $e^{-6}$ ; **5.103.**  $\frac{1}{2}$ ; **5.104.**  $\frac{1}{2}$ ; **5.105.** 1; **5.106.**  $e^{12}$ ; **5.107.**  $\frac{9}{5}$ ; **5.108.**  $\ln\frac{3}{2}$ ; **5.109.**  $\ln\frac{4}{7}$ ; **5.110.** ∞; **5.111.**  $\ln 4$ ; **5.112.**  $\frac{3}{2}$ ; **5.113.** 4; **5.114.** ∞; **5.115.**  $\frac{7}{3}$ ; **5.117.** неперервна; **5.118.** розрив I роду в т.  $x = 1$ ; **5.119.** неперервна; **5.119.** розрив I роду в т.  $x = \frac{1}{2}$  і  $x = 1$ ; **5.120.** неперервна; **5.121.** розрив I роду в т.  $x = 2$ ; **5.122.** неперервна; **5.123.** розрив I роду в т.  $x = 1$ ; **5.124.** розрив II роду в т.  $x = 1$ ; **5.125.** розрив II роду в т.  $x = 0$ ; **5.126.** розрив II роду в т.  $x = -2$  і  $x = 2$ ; **5.127.** розрив II роду в т.  $x = -1$ ; **5.128.** розрив II роду в т.  $x = 1$ ; **5.129.** розрив II роду в т.  $x = -2$ ; **5.130.** розрив II роду в т.  $x = -4$ ; **5.131.** розрив II роду в т.  $x = 3$ ; **5.132.** розрив II роду в т.  $x = 1$ ; **5.133.** розрив II роду в т.  $x = -1$ ; **5.134.** розрив II роду в т.  $x = -4$ ,  $x = 0$ ,  $x = 1$ ; **5.135.** розрив II роду в т.  $x = 1$ .

## РОЗДІЛ 6:

**6.1.**  $y' = 20x^4 - x$ ; **6.2.**  $y' = 2x^7 - 2x + \frac{1}{2\sqrt{x}}$ ; **6.3.**  $y' = 12x^2 - x + 1$ ; **6.4.**  
 $y' = 24x^5 - 7x^6 + 3$ ; **6.5.**  $y' = 2x - x^4$ ; **6.6.**  $y' = 6x^2 - 0,5x$ ; **6.7.**  $y' = 8x - 7$ ; **6.8.**  
 $y' = 6x^2 - 2x - \frac{1}{x^2}$ ; **6.9.**  $y' = 14x^6 - x^5$ ; **6.10.**  $y' = 3x^2 - x^6$ ; **6.11.**  $y' = \frac{3}{4\sqrt[4]{x}} - \frac{6}{x^4}$ ;

**6.12.**  $y' = \frac{5}{3}\sqrt[3]{x^2} - \frac{18}{x^4}$ ; **6.13.**  $y' = \frac{5}{6\sqrt[6]{x}} - \frac{18}{x^7}$ ; **6.14.**  $y' = \frac{6}{7\sqrt[7]{x}} - \frac{28}{x^8}$ ; **6.15.**  
 $y' = \frac{7}{6}\sqrt[6]{x} - \frac{12}{x^7}$ ; **6.16.**  $y' = \frac{8}{7}\sqrt[7]{x} - \frac{1}{3x^4}$ ; **6.17.**  $y' = \frac{2}{3\sqrt[3]{x}} - \frac{8}{x^5}$ ; **6.18.**  
 $y' = \frac{3}{5\sqrt[5]{x^2}} - \frac{42}{x^8}$ ; **6.19.**  $y' = \frac{7}{8\sqrt[8]{x}} - \frac{72}{x^9}$ ; **6.20.**  $y' = \frac{3}{4\sqrt[4]{x}} - \frac{6}{x^4}$ ; **6.21.**

**4.22.**  $y' = e^x \cdot \sin x + e^x \cdot \cos x$ ; **4.23.**  $y' = e^x \cdot \sqrt[3]{x} + e^x \cdot \frac{1}{3\sqrt[3]{x^2}}$

**6.24.**  $y' = \cos x \cdot \frac{1}{x} - \sin x \cdot \ln x$ ; **6.25.**  $y' = \cos x \cdot \frac{1}{x \ln 2} - \sin x \cdot \log_2 x$

**6.26.**  $y' = \log_7 x + \frac{1}{\ln 7}$ ; **6.27.**  $y' = -\frac{1}{\sqrt{1-x^2}} \log_5 x + \arccos x \cdot \frac{1}{x \ln 5}$

**6.28.**  $y' = \cos x \cdot 3^x + \sin x \cdot 3^x \ln 3$ ; **6.29.**  $y' = \operatorname{ctg} x \cdot \frac{1}{2\sqrt{x}} - \frac{1}{\sin^2 x} \cdot \sqrt{x}$

**6.30.**  $y' = \frac{1}{\cos^2 x} \cdot \sqrt[3]{x} + \operatorname{tg} x \cdot \frac{1}{3\sqrt[3]{x^2}}$ ; **6.31.**  $y' = e^x \cdot \ln x + e^x \cdot \frac{1}{x}$

**6.32.**  $y' = \frac{\frac{1}{2\sqrt{x}} \cdot \operatorname{tg} x - \sqrt{x} \cdot \frac{1}{\cos^2 x}}{\operatorname{tg}^2 x}$ ; **6.33.**  $y' = \frac{6x^5 \cdot \sqrt{x} - (x^6 - 25) \cdot \frac{1}{2\sqrt{x}}}{x}$

**6.34.**  $y' = \frac{\frac{1}{1+x^2} \cdot x - \frac{1}{2\sqrt{x}} \cdot \operatorname{arctg} x}{\sqrt{x}}$ ; **6.35.**  $y' = \frac{\frac{1}{\cos^2 x} \cdot \sqrt{x} - \frac{1}{2\sqrt{x}} \cdot \operatorname{tg} x}{\sqrt{x}}$ ; **6.36.**  $y' = \frac{\ln x - 1}{\ln^2 x}$

**6.36.**  $y' = \frac{2x \cdot \sin x - \cos x \cdot x^2}{\sin^2 x}$ ; **6.37.**  $y' = \frac{e^x \cdot \cos x - e^x \cdot \sin x}{\cos^2 x}$ ; **6.38.**

**6.39.**  $y' = \frac{e^x \cdot \arccos x + e^x \cdot \frac{1}{\sqrt{1-x^2}}}{\arccos^2 x}$ ; **6.40.**  $y' = \frac{5\cos x - 5x \cdot \sin x}{\cos^2 x}$

$$y' = \frac{16x^3 - 18x}{2\sqrt{x+4}} - \frac{(4x^4 - 9x^2) \cdot \sqrt{x+4}}{\sqrt{x+4}}; \quad \mathbf{6.41.} \quad y' = 5^{\arcsin 4x} \ln 5 \cdot \frac{4}{\sqrt{1-16x^2}}; \quad \mathbf{6.42.}$$

$$y' = \frac{\ln 2}{2\sqrt{\ln 2^x}}; \quad \mathbf{6.43.} \quad y' = \frac{-\sin x}{2\sqrt{\cos x}}; \quad \mathbf{6.44.} \quad y' = \frac{\cos x}{2\sqrt{\sin x}}; \quad \mathbf{6.45.} \quad y' = \frac{3}{2} \cdot \sqrt{e^{3x}}; \quad \mathbf{6.46.}$$

$$y' = \frac{2x-1}{2\sqrt{x^2-x}}; \quad \mathbf{6.47.} \quad y' = \frac{8x}{2\sqrt{4x^2-3}}; \quad \mathbf{6.48.} \quad y' = \frac{1}{2x}; \quad \mathbf{6.49.} \quad y' = \frac{1}{2\sqrt{e^x}}; \quad \mathbf{6.50.}$$

$$y' = 2^{\sin 4x} \ln 2 \cdot \cos 4x \cdot 4; \quad \mathbf{6.51.} \quad y' = 2 \arctg x \cdot \frac{1}{1+x^2}; \quad \mathbf{6.52.} \quad y' = 3 \ln^2 x \cdot \frac{1}{x}; \quad \mathbf{6.53.}$$

$$y' = -8 \cos^3(2x+5) \cdot \sin x; \quad \mathbf{6.54.} \quad y' = \frac{5x}{1+x^{10}}; \quad \mathbf{6.55.}$$

$$y' = -2 \sin \cos x \cdot \cos x \cos x \cdot \sin x; \quad \mathbf{6.56.} \quad y' = \frac{\cos \sqrt{x}}{2\sqrt{\sin \sqrt{x}}} \cdot \frac{1}{2\sqrt{x}}; \quad \mathbf{6.57.} \quad y' = \frac{-18}{x \ln^7 2x};$$

$$\mathbf{6.58.} \quad y' = \frac{1}{\arctg \sqrt{x^2+4}} \cdot \frac{2x}{5+x^2} \cdot \frac{1}{2\sqrt{x^2+4}}; \quad \mathbf{6.59.}$$

$$y' = -\frac{1}{2\sqrt{\ln \arccos 2^x}} \cdot \frac{1}{\arccos 2^x} \cdot \frac{2^x \ln 2}{\sqrt{1-2^{2x}}}; \quad \mathbf{6.60.} \quad y' = \cos \sqrt{\ln 8^x} \cdot \frac{\ln 8}{2\sqrt{\ln 8^x}}; \quad \mathbf{6.61.}$$

$$y' = \frac{6}{5\sqrt[5]{\log_{12}(6x+5)} \cdot (6x+5) \ln 12}; \quad \mathbf{6.62.} \quad y' = 7^{\arctg(\arcsin x^{-3})} \ln 7.$$

$$\cdot \frac{1}{1+(\arcsin x-3)^2} \cdot \frac{1}{\sqrt{1-x^2}}; \quad \mathbf{6.71.} \quad y' = \frac{1+2xy^2}{3-2x^2y}; \quad \mathbf{6.72.} \quad y' = \frac{2x+y^3+1}{3-3xy^2}; \quad \mathbf{6.73.}$$

$$y' = \frac{y}{e^y - x - 20y^4}; \quad \mathbf{6.74.} \quad y' = \frac{\cos(x-y) \cdot \sin(x+y) - 1}{\cos(x-y) \cdot \sin(x+y) + 1}; \quad \mathbf{6.75.}$$

$$y' = \frac{x^2 + xy - 2x + y}{x - x^2 + xy}; \quad \mathbf{6.76.} \quad y' = \frac{y(e^{xy} - 1)}{x(e^{xy} - 1) - \frac{4}{\cos^2 4y}}; \quad \mathbf{6.77.}$$

$$y' = \frac{\frac{1}{\sqrt{1-(x-y)^2}} + \frac{1}{1+(x+y)^2}}{\frac{1}{\sqrt{1-(x-y)^2}} - \frac{1}{1-(x+y)^2}}; \quad \mathbf{6.78.} \quad y' = -\frac{y + \cos(\ln(x^2+x)) \cdot \frac{2x+1}{x^2+x}}{x}; \quad \mathbf{6.81.}$$

$$y'_x = -\frac{3t^2}{2t+1}; \quad \mathbf{6.82.} \quad y'_x = -\frac{3t^2-6}{6t+1}; \quad \mathbf{6.83.} \quad y'_x = -\frac{2t-9}{t^3+1,5t}; \quad \mathbf{6.84.} \quad y'_x = -\frac{1}{\ln 2}; \quad \mathbf{6.85.}$$

$$y'_x = \frac{\cos(t+1)-4\sin 4t}{\cos t+(2t+1)\sin(x+y)+1}; \quad \mathbf{6.85.} \quad y'_x = \frac{\sin 4t-e^{-t}}{e^t-7\cos t}; \quad \mathbf{6.87.}$$

$$y'_x = \frac{2x \cdot (1+\cos x)+\sin x \cdot (x^2-4)}{(1+\cos x)^2}; \quad \mathbf{6.88.} \quad y'_x = \frac{2x \cdot (x^2+3x)+(2x+3) \cdot (x^2-4)}{(x^2+3x)^2};$$

$$\mathbf{6.90.} \quad y'_x = \frac{(e^{-x}+\cos 7x)-(-e^{-x}-7\sin 7x)}{(e^{-x}+\cos 7x)^2}; \quad \mathbf{6.94.} \quad y'_x = -\frac{8}{(x-4)^2}; \quad \mathbf{6.95.}$$

$$y'_x = \frac{3x^2+2x}{x^3+x^2} \cdot \ln x - \frac{\ln(x^3+x^2)}{x}; \quad \mathbf{6.101.} \approx 0,976; \quad \mathbf{6.102.} \approx 1,994; \quad \mathbf{6.103.} \approx 2,136;$$

$$\mathbf{6.104.} \approx 0,106; \quad \mathbf{6.105.} \approx 3,276; \quad \mathbf{6.106.} \approx 4,731; \quad \mathbf{6.107.} \approx 5,051; \quad \mathbf{6.108.} \approx 7,28;$$

$$\mathbf{6.109.} \approx 1,041; \quad \mathbf{6.110.} \approx 1,9; \quad \mathbf{6.111.} \approx 0,695; \quad \mathbf{6.112.} \approx 0,724; \quad \mathbf{6.113.} \approx 0,088;$$

$$\mathbf{6.114.} \approx 0,906; \quad \mathbf{6.115.} \approx 0,875; \quad \mathbf{6.116.} \approx 0,47; \quad \mathbf{6.117.} \approx 1062,98; \quad \mathbf{6.118.} \approx 1,518.$$

### РОЗДІЛ 7:

$$\mathbf{7.11.} \quad y_{\min}(0,75) = -2,25; \quad \text{зростає: } (0,75;+\infty); \quad \text{спадає: } (-\infty;0,75); \quad \mathbf{7.12.}$$

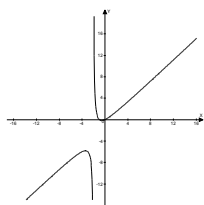
$$y_{\max}(0,58) = 1,38; \quad y_{\min}(-0,58) = 0,62; \quad \text{зростає: } (-0,58;0,58); \quad \text{спадає:}$$

$$(-\infty;-0,58) \cup (0,58;+\infty); \quad \mathbf{7.13.} \quad y_{\max}(0) = 2; \quad y_{\min}(-1) = 1; \quad y_{\min}(1) = 1; \quad \text{зростає:}$$

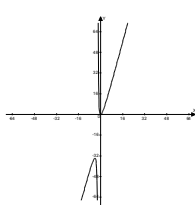
$$(-1;0) \cup (1;+\infty); \quad \text{спадає: } (-\infty;-1) \cup (0;1); \quad \mathbf{7.14.} \quad y_{\max}(-1) = -2; \quad y_{\min}(1) = 2; \quad \text{зростає:}$$

$$(-\infty;-1) \cup (1;+\infty); \quad \text{спадає: } (-1;1); \quad \mathbf{7.16.} \quad y_{\max}(-1,41) = 4; \quad y_{\max}(1,41) = 4;$$

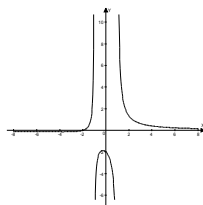
$$y_{\min}(0) = 0; \quad \text{зростає: } (-\infty;-1,41) \cup (0;1,41); \quad \text{спадає: } (-1,41;0) \cup (1,41;+\infty); \quad \mathbf{7.31.}$$



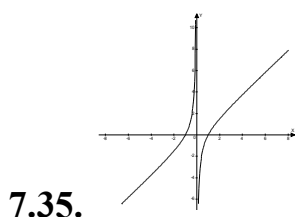
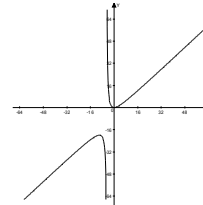
**7.32.**



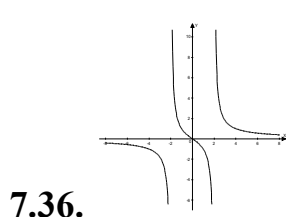
**7.33.**



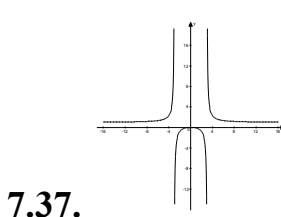
**7.34.**



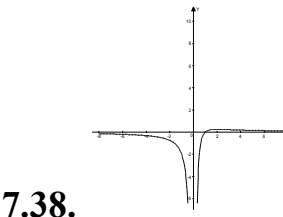
**7.35.**



**7.36.**

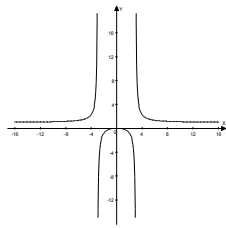


**7.37.**

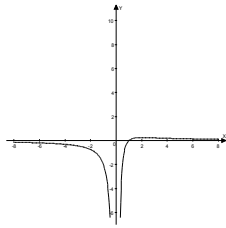


**7.38.**





7.39.



7.40.

## РОЗДІЛ 8:

$$8.01. \quad \frac{\partial z}{\partial x} = 12x^2y^2 - 12y^3 + \frac{\sqrt{y}}{2\sqrt{x}}; \quad \frac{\partial z}{\partial y} = 8x^3y - 36xy^2 + \frac{\sqrt{x}}{2\sqrt{y}}; \quad 8.02. \quad \frac{\partial z}{\partial x} = 3x^2y +$$

$$+ 4xy^2 - \frac{1}{2\sqrt{x+y}}; \quad \frac{\partial z}{\partial y} = x^3 + 4x^2y - \frac{1}{2\sqrt{x+y}}; \quad 8.03. \quad \frac{\partial z}{\partial x} = 6xy^3 + 6x^2y^2 + \frac{1}{\sqrt{2x}};$$

$$\frac{\partial z}{\partial y} = 9x^2y^2 - 4x^3y; \quad 8.04. \quad \frac{\partial z}{\partial x} = 16x^3y^3 + 1,5x^2y^2; \quad \frac{\partial z}{\partial y} = 12x^3y^2 + x^3y + \frac{1}{2\sqrt{3+y}};$$

$$8.05. \quad \frac{\partial z}{\partial x} = 4x^3y^3 + y^2 - \sin x; \quad \frac{\partial z}{\partial y} = 3x^4y^2 + 2xy; \quad 8.06. \quad \frac{\partial z}{\partial x} = x^3 + 10x^{19}y^2 + \cos x;$$

$$\frac{\partial z}{\partial y} = 3xy^2 - 2x^{10}y; \quad 8.07. \quad \frac{\partial z}{\partial x} = y^2 + 2\cos 2x; \quad \frac{\partial z}{\partial y} = \frac{3}{y} + 2xy; \quad 8.08.$$

$$\frac{\partial z}{\partial x} = 2\ln y \cdot \frac{1}{y} + 4x^3y^2; \quad \frac{\partial z}{\partial y} = 2x^4y + 2y \cdot \cos y^2; \quad 8.09. \quad \frac{\partial z}{\partial x} = \frac{2}{x \ln 2} + \frac{3y^2}{2\sqrt{x}};$$

$$\frac{\partial z}{\partial y} = 6\sqrt{xy} + 6; \quad 8.10. \quad \frac{\partial z}{\partial x} = 3xy^2 + 10; \quad \frac{\partial z}{\partial y} = \frac{1}{y \ln 3} + 3xy^2; \quad 8.11. \quad \frac{\partial z}{\partial x} = \frac{\sin y}{2\sqrt{x}};$$

$$\frac{\partial z}{\partial y} = \sqrt{x} \cdot \cos y; \quad 8.12. \quad \frac{\partial z}{\partial x} = \frac{\cos y}{2\sqrt{x+2}}; \quad \frac{\partial z}{\partial y} = -\sqrt{x+2} \cdot \sin y; \quad 8.13. \quad \frac{\partial z}{\partial x} = \frac{2x - y^5}{2\sqrt{x^2 - xy^5}};$$

$$\frac{\partial z}{\partial y} = \frac{-5xy^4}{2\sqrt{x^2 - xy^5}}; \quad 8.14. \quad \frac{\partial z}{\partial x} = \frac{1}{y}; \quad \frac{\partial z}{\partial y} = -\frac{x}{y^2}; \quad 8.15. \quad \frac{\partial z}{\partial x} = \frac{y \cdot (x^2 + y) - 2x^2y}{(x^2 + y)^2};$$

$$\frac{\partial z}{\partial y} = \frac{x \cdot (x^2 + y) - xy}{(x^2 + y)^2}; \quad 8.16. \quad \frac{\partial z}{\partial x} = -\frac{\ln y}{(x+10)^2}; \quad \frac{\partial z}{\partial y} = \frac{1}{y \cdot (x+10)}; \quad 8.17.$$

$$\frac{\partial z}{\partial x} = -\frac{\ln y}{x^2y}; \quad \frac{\partial z}{\partial y} = \frac{x - y \ln y}{x^2y^2}; \quad 8.18. \quad \frac{\partial z}{\partial x} = -\frac{\ln y}{2\sqrt{x^3}}; \quad \frac{\partial z}{\partial y} = \frac{1}{y \cdot \sqrt{x}}; \quad 8.19.$$

$$\frac{\partial z}{\partial x} = -\frac{\sin x}{\sqrt{y}}; \quad \frac{\partial z}{\partial y} = \frac{\cos x}{2\sqrt{y}}; \quad 8.20. \quad \frac{\partial z}{\partial x} = -\frac{1}{\sqrt{y} \cdot \sqrt{1-x^2}}; \quad \frac{\partial z}{\partial y} = \frac{\arccos x}{2\sqrt{y}}; \quad 8.21.$$

$$\frac{\partial z}{\partial x} = ye^{xy} \cdot \sqrt{2y}; \quad \frac{\partial z}{\partial y} = xe^{xy} \cdot \sqrt{2y} + \frac{e^{xy}}{2\sqrt{2y}}; \quad \mathbf{8.22.} \quad \frac{\partial z}{\partial x} = \frac{2x+2e^x}{3y}; \quad \frac{\partial z}{\partial y} = -\frac{x^2+2e^x}{3y^2};$$

$$\mathbf{8.23.} \quad \frac{\partial z}{\partial x} = \frac{2x+2e^y}{4y}; \quad \frac{\partial z}{\partial y} = \frac{8ye^y-4(x^2+2e^y)}{16y^2}; \quad \mathbf{8.24.} \quad \frac{\partial z}{\partial x} = -\frac{\ln y}{(x+y)^2};$$

$$\frac{\partial z}{\partial y} = \frac{\frac{x+y}{y} - \ln y}{(x+y)^2}; \quad \mathbf{8.25.} \quad \frac{\partial z}{\partial x} = \frac{4\sin^3 y}{2\sqrt{4x-3}}; \quad \frac{\partial z}{\partial y} = 3\sin^2 y \cdot \cos x \cdot \sqrt{4x-3}; \quad \mathbf{8.26.}$$

$$\frac{\partial z}{\partial x} = \frac{\cos y^3}{\sqrt{x}}; \quad \frac{\partial z}{\partial y} = -3y \cdot \sin y^3 \cdot \sqrt{2x}; \quad \mathbf{8.27.} \quad \frac{\partial z}{\partial x} = \frac{1}{(x+y) \cdot \sqrt{1-x^2}}; \quad \frac{\partial z}{\partial y} =$$

$$= \frac{\frac{x+y}{\sqrt{1-x^2}} + \arcsin x}{(x+y)^2}; \quad \mathbf{8.28.} \quad \frac{\partial z}{\partial x} = \frac{2x^2 y^3 \cdot (x^2 + y^3) - 2x^3 y^3}{(x^2 + y^3)^2}; \quad \frac{\partial z}{\partial y} = \frac{3x^2 y^2}{(x^2 + y^3)^2}$$

$$- \frac{3x^2 y^5}{(x^2 + y^3)^2}; \quad \mathbf{8.31.} \quad \overrightarrow{\text{grad} z} = 5\vec{i} + 1\frac{1}{3}\vec{j}; \quad \mathbf{8.32.}$$

$$\overrightarrow{\text{grad} z} = \left(\frac{5}{2} - \frac{1}{3\sqrt{25}}\right)\vec{i} + \left(\frac{7}{16} - \frac{1}{3\sqrt{25}}\right)\vec{j}; \quad \mathbf{8.33.} \quad \overrightarrow{\text{grad} z} = \frac{2}{81}\vec{i} + \frac{4}{243}\vec{j}; \quad \mathbf{8.34.}$$

$$\overrightarrow{\text{grad} z} = -7\vec{i} - \vec{j}; \quad \mathbf{8.35.} \quad \overrightarrow{\text{grad} z} = -\frac{\sqrt{2}}{4}\vec{i} - \frac{\sqrt{2}}{4}\vec{j}; \quad \mathbf{8.36.} \quad \overrightarrow{\text{grad} z} = 2\vec{i} + \vec{j}; \quad \mathbf{8.37.}$$

$$\overrightarrow{\text{grad} z} = 576\vec{i} + 2304\vec{j}; \quad \mathbf{8.38.} \quad \left(\frac{\sqrt{2}}{2}; -\frac{\sqrt{2}}{2}\right); \quad \mathbf{8.39.} \quad (-0,8; 0,6); \quad \mathbf{8.40.} \quad (0;1); \quad \mathbf{8.41.}$$

$$\left(\frac{5}{\sqrt{26}}; \frac{1}{\sqrt{26}}\right); \quad \mathbf{8.42.} \quad (-0,6; -0,8); \quad \mathbf{8.43.} \quad \left(-\frac{5}{\sqrt{13}}; -\frac{12}{\sqrt{13}}\right); \quad \mathbf{8.44.} \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = -0,1125;$$

$$\mathbf{8.45.} \quad \overrightarrow{\text{grad} z} = \frac{3}{8}\vec{i} - \frac{1}{16}\vec{j}; \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = -\frac{1}{8}; \quad \mathbf{8.46.} \quad \overrightarrow{\text{grad} z} = -\frac{3}{32}\vec{i} + \frac{3}{64}\vec{j}; \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = \frac{3}{32}; \quad \mathbf{8.47.}$$

$$\overrightarrow{\text{grad} z} = 3\vec{i} + 2\vec{j}; \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = \frac{4}{\sqrt{5}}; \quad \mathbf{8.48.} \quad \overrightarrow{\text{grad} z} = 1,5\vec{i} + \vec{j}; \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = \frac{2}{\sqrt{5}}; \quad \mathbf{8.49.}$$

$$\overrightarrow{\text{grad} z} = -\frac{1}{\sqrt{15}}\vec{i} + \frac{1}{\sqrt{15}}\vec{j}; \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = -\frac{17}{13\sqrt{15}}; \quad \mathbf{8.50.} \quad \overrightarrow{\text{grad} z} = 0,8\vec{i} + 0,2\vec{j}; \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = \frac{8,6}{13};$$

$$\mathbf{8.51.} \quad \overrightarrow{\text{grad} z} = \frac{2}{13}\vec{i} + \frac{8}{13}\vec{j}; \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = \frac{38}{65}; \quad \mathbf{8.52.} \quad \overrightarrow{\text{grad} z} = 0,2\vec{i} + 0,4\vec{j}; \quad \left.\frac{\partial z}{\partial \vec{l}}\right|_M = -0,2;$$

**8.53.**  $\overrightarrow{\text{grad}}z = 0,25\vec{i} + 0,25\vec{j}$ ;  $\left. \frac{\partial z}{\partial \vec{l}} \right|_M = -0,05$ ; **8.54.**  $\overrightarrow{\text{grad}}z = -0,25\vec{i}$ ;  $\left. \frac{\partial z}{\partial \vec{l}} \right|_M = -0,15$ ;

**8.55.**  $\approx 6,83$ ; **8.56.**  $\approx 2,68$ ; **8.57.**  $\approx 22,66$ ; **8.58.**  $\approx 0,96$ ; **8.59.**  $\approx 119,34$ ; **8.60.**

$\approx 0,03$ ; **8.61.**  $\approx 0,499$ ; **8.62.**  $\approx 3,392$ ; **8.63.**  $\approx -4,76$ ; **8.64.**  $\approx -10,225$ ; **8.65.**

$\approx -0,175$ ; **8.66.**  $\approx -0,087$ ; **8.67.**  $\approx 0,027$ ; **8.68.**  $\approx 0,637$ ; **8.69.**  $\approx 0,747$ ; **8.70.**

$\approx 0,649$ ; **8.81.**  $z_{\max} = z(20;30) = 500$ ; **8.82.**  $z_{\max} = z(10;50) = 2850$ ; **8.83.**

$z_{\max} = z(40;30) = 700$ ; **8.84.**  $z_{\max} = z(20;50) = 800$ ; **8.85.**  $z_{\max} = z(20;40) = 300$ ;

**8.86.**  $z_{\max} = z(10;40) = 200$ ; **8.87.**  $z_{\max} = z(50;20) = 900$ ; **8.88.**  $z_{\min} = z(2;2) = 4$ ;

$z_{\max} = z(-2;2) = 4$ ; **8.89.**  $z_{\min} = z(1;1) = 2$ ; **8.90.**  $z_{\min} = z\left(-\frac{3}{2}; -\frac{3}{2}\right) = -\frac{19}{4}$ .

### РОЗДІЛ 9:

**9.1.**  $\frac{10x}{3} + x^2 + 3\ln|x| + C$ ; **9.2.**  $5x + \frac{1}{7x} + \sin x + C$ ; **9.3.**  $\frac{x^2}{10} + 5x + \sin x + C$ ;

**9.4.**  $\frac{5x^6}{3} - \frac{x^2}{2} + 3\ln x + C$ ; **9.5.**  $\frac{x^8}{4} - \frac{x^7}{42} - 2x + C$ ; **9.6.**  $\frac{4x^3}{3} - \frac{7x^2}{2} + 2x + C$ ;

**9.7.**  $x^3 + 2x^2 + 5\ln x + C$ ; **9.8.**  $2x^5 + 6x^2 - \cos x + C$ ; **9.9.**  $x^4 + \frac{2x^3}{3} + \ln x + C$ ; **9.10.**

$x^3 + \frac{3x^2}{2} + 4\ln x + C$ ; **9.11.**  $\frac{4}{5}\sqrt[4]{x^5} - \frac{11}{15\sqrt[11]{x^{15}}} + C$ ; **9.12.**  $\frac{7}{3}x^3 - \frac{9}{4}\sqrt[9]{x^4} + 6x + C$ ; **9.13.**

$\frac{3}{4}\sqrt[3]{x^4} + 4\sqrt[4]{x^5} + C$ ; **9.17.**  $\frac{11}{12}\sqrt[11]{x^{12}} - 6\sqrt[6]{x} + C$ ; **9.18.**  $\frac{9}{5}\sqrt[3]{x^5} - \frac{2}{3}x^3 + x + C$ ; **9.19.**

$\frac{28}{15}\sqrt[7]{x^{15}} - \frac{1}{6x^2} + 2x + C$ ; **9.20.**  $\frac{7}{8}\sqrt[7]{x^8} - 3\sqrt[3]{x} - x^2 + C$ ; **9.21.**  $\frac{1}{4}\sin(4x-1) + C$ ; **9.22.**

$-\frac{1}{3}\ln|1-3x| + C$ ; **9.23.**  $-\frac{1}{4}e^{6-4x} + C$ ; **9.24.**  $4^{\frac{x}{4+2}} + C$ ; **9.25.**  $\frac{1}{4}\text{ctg}(3-4x) + C$ ;

**9.26.**  $-\frac{1}{4}\arctg(3-4x) + C$ ; **9.27.**  $\frac{1}{8}\sin(8x+3) + C$ ; **9.28.**  $\arcsin 3x + C$ ; **9.29.**

$-3\text{ctg}\frac{x}{3} + C$ ; **9.30.**  $-\frac{1}{8}\ln|3-8x| + C$ ; **9.31.**  $\frac{1}{5}\ln|1+x^5| + C$ ; **9.32.**  $\arctg e^x + C$ ; **9.33.**

$\frac{1}{6}\sqrt{(x^3-4)^3} + C$ ; **9.34.**  $\ln|\ln|x|| + C$ ; **9.35.**  $\ln|e^x+1| + C$ ; **9.36.**  $\frac{1}{3}\ln^3 x + C$ ; **9.37.**

$$-\frac{1}{\ln|x|} + C; \quad \mathbf{9.38.} \quad \frac{1}{4} \ln|1+x^4| + C; \quad \mathbf{9.39.} \quad 2\sqrt{e^x+1} + C; \quad \mathbf{9.40.} \quad \frac{1}{2} \ln^2|x| + C; \quad \mathbf{9.41.}$$

$$e^x(x-1) + C; \quad \mathbf{9.42.} \quad \frac{x^3}{3} \ln|x| - \frac{1}{9} x^3 + C; \quad \mathbf{9.43.} \quad (x-2)\sin x + \cos x + C; \quad \mathbf{9.45.}$$

$$\frac{3}{2} \sqrt{x^3} (\ln|x|-1) + C; \quad \mathbf{9.46.} \quad C - \frac{\ln|x|-1}{x}; \quad \mathbf{9.47.} \quad -x \operatorname{ctg} x + \ln|\sin x| + C; \quad \mathbf{9.48.}$$

$$x^2 \sin x + 2x \cos x - 2 \sin x + C; \quad \mathbf{9.49.} \quad \frac{e^{2x}}{2} \left( (x+3)^2 - (x+3) + \frac{1}{2} \right) + C; \quad \mathbf{9.50.}$$

$$\frac{1}{5} (4-x)^2 \cos x + \frac{2}{5} (4-x) \sin x + \sin x + C; \quad \mathbf{9.61.} \quad \frac{1}{3} \ln \left| \frac{x-5}{x-2} \right| + C; \quad \mathbf{9.62.}$$

$$\frac{1}{4} \operatorname{arctg} \left( \frac{2x+1}{2} \right) + C; \quad \mathbf{9.63.} \quad \frac{1}{3\sqrt{3}} \operatorname{arctg} \left( \frac{3x+1}{\sqrt{3}} \right) + C; \quad \mathbf{9.64.}$$

$$\frac{1}{2} \ln|4x^2 - 4x + 5| + \frac{1}{4} \operatorname{arctg} \left( \frac{2x-1}{2} \right) + C; \quad \mathbf{9.65.} \quad \ln \frac{(x-4)^2}{|x-3|} + C; \quad \mathbf{9.66.}$$

$$\arcsin(x-2) + C; \quad \mathbf{9.67.} \quad \frac{1}{3} \arcsin \frac{3x+1}{\sqrt{3}} + C; \quad \mathbf{9.68.}$$

$$3\sqrt{x^2+2x+2} - 4 \ln|x+1+\sqrt{x^2+2x+2}| + C; \quad \mathbf{9.69.} \quad \ln \left| \frac{x-1}{\sqrt{2x-1}} \right| + C; \quad \mathbf{9.70.}$$

$$\ln \left( \frac{x-5}{x+3} \right)^2 + C; \quad \mathbf{9.71.} \quad \frac{9}{2} \ln|2x+1| - \frac{5}{3} \ln|3x+2| + C; \quad \mathbf{9.72.}$$

$$\frac{1}{2} \ln|2x-1| - \frac{1}{3} \ln|3x+2| + C; \quad \mathbf{9.73.} \quad \ln \left| \frac{x^4}{x-1} + C \right|; \quad \mathbf{9.74.} \quad -2,5 \ln|x+1| + 3,5 \ln|x+5| + C;$$

$$\mathbf{9.79.} \quad \frac{3}{16} \sin \frac{8}{3} x - \frac{3}{8} \sin \frac{4}{3} x + C; \quad \mathbf{9.80.} \quad C - \frac{1}{8} \cos 4x - \frac{1}{16} \cos 8x; \quad \mathbf{9.81.}$$

$$3 \sin \frac{x}{6} + \frac{3}{5} \sin \frac{5x}{6} + C; \quad \mathbf{9.82.} \quad \frac{1}{4} \sin 2x - \frac{1}{16} \sin 8x + C; \quad \mathbf{9.83.} \quad \frac{1}{14} \sin 7x - \frac{1}{6} \sin 3x + C;$$

$$\mathbf{9.84.} \quad \frac{1}{14} \sin 7x + \frac{1}{6} \sin 3x + C; \quad \mathbf{9.85.} \quad \frac{1}{6} \cos 3x - \frac{1}{14} \cos 7x + C; \quad \mathbf{9.86.}$$

$$\frac{1}{8} \sin 4x + \frac{1}{4} \sin 2x + C; \quad \mathbf{9.87.} \quad \ln \left| \operatorname{tg} \frac{x}{2} \right| + C; \quad \mathbf{9.88.} \quad \frac{2}{3} \operatorname{arctg} \left( \frac{5 \operatorname{tg} \frac{x}{2} + 4}{3} \right) + C; \quad \mathbf{9.89.}$$

$$\frac{1}{\sqrt{5}} \ln \left| \frac{\sqrt{5 + \operatorname{tg} \frac{x}{2}}}{\sqrt{5 - \operatorname{tg} \frac{x}{2}}} \right| + C; \quad \mathbf{9.90.} \quad C - \frac{1}{2\sqrt{3}} \ln \left| \frac{\operatorname{tg} \frac{x}{2} - 3 - 2\sqrt{3}}{\operatorname{tg} \frac{x}{2} - 3 + 2\sqrt{3}} \right|; \quad \mathbf{9.91.} \quad C - \frac{2}{\operatorname{tg} \frac{x}{2}}; \quad \mathbf{9.92.}$$

$$\frac{2}{\sqrt{3}} \operatorname{arctg} \left( \frac{2\operatorname{tg} \frac{x}{2} + 1}{\sqrt{3}} \right) + C; \quad \mathbf{9.93.} \quad \frac{x}{2} - \frac{1}{8} \sin 4x + C; \quad \mathbf{9.94.} \quad \frac{x}{2} + \frac{1}{16} \sin 8x + C; \quad \mathbf{9.95.}$$

$$\frac{3x}{8} + \frac{1}{4} \sin 2x + \frac{1}{32} \sin 4x + C; \quad \mathbf{9.96.} \quad \frac{1}{2} \cos 2x - \frac{1}{6} \cos^3 2x + C; \quad \mathbf{9.97.}$$

$$\sin x - \frac{2}{3} \sin^3 x + \frac{1}{5} \sin^5 x + C; \quad \mathbf{9.98.} \quad C - \frac{1}{3 \cos^3 x} + \frac{1}{\cos x}; \quad \mathbf{9.99.} \quad \sin x - \frac{1}{\sin x} + C;$$

$$\mathbf{9.100.} \quad \frac{1}{5} \cos^5 x - \frac{1}{7} \cos^7 2x + C; \quad \mathbf{9.101.} \quad \frac{1}{4} \sin^4 x - \frac{1}{6} \sin^6 x + C; \quad \mathbf{9.102.}$$

$$\frac{1}{5} \cos^5 x - \frac{2}{7} \cos^7 2x + \frac{1}{9} \cos^9 x + C.$$

### РОЗДІЛ 10:

$$\mathbf{10.1.} \quad 19\frac{1}{6}; \quad \mathbf{10.2.} \quad 0; \quad \mathbf{10.3.} \quad \frac{7}{72}; \quad \mathbf{10.4.} \quad -5(\sqrt[5]{16} - 1); \quad \mathbf{10.5.} \quad 7\frac{2}{3}; \quad \mathbf{10.6.} \quad \operatorname{arctg} \frac{1}{7}; \quad \mathbf{10.7.}$$

$$\frac{1}{2} \ln 2; \quad \mathbf{10.8.} \quad \frac{3 - \sqrt{3}}{3}; \quad \mathbf{10.9.} \quad \frac{3\pi}{8} + \frac{\ln 2}{2}; \quad \mathbf{10.10.} \quad \frac{4}{3} \ln \frac{6}{5} - \frac{1}{3} \ln \frac{3}{2}; \quad \mathbf{10.11.} \quad 1; \quad \mathbf{10.12.} \quad 0;$$

$$\mathbf{10.13.} \quad \frac{\pi}{6}; \quad \mathbf{10.15.} \quad 2; \quad \mathbf{10.16.} \quad 1; \quad \mathbf{10.17.} \quad \sqrt{2} - 1; \quad \mathbf{10.18.} \quad \frac{\pi}{4}; \quad \mathbf{10.19.} \quad \frac{4}{3}; \quad \mathbf{10.20.} \quad \frac{1}{2} \ln \frac{4}{3};$$

$$\mathbf{10.21.} \quad 2 \ln 2 - \frac{3}{4}; \quad \mathbf{10.22.} \quad 1 - \frac{2}{e}; \quad \mathbf{10.23.} \quad \ln(3\sqrt{3}) - \frac{1}{4}; \quad \mathbf{10.26.} \quad \frac{\pi\sqrt{3}}{6} - \frac{1}{2}; \quad \mathbf{10.27.}$$

$$\frac{1}{6} \text{кв.од.}; \quad \mathbf{10.28.} \quad 1\frac{1}{3} \text{кв.од.}; \quad \mathbf{10.29.} \quad 10\frac{2}{3} \text{кв.од.}; \quad \mathbf{10.30.} \quad 10\frac{2}{3} \text{кв.од.}; \quad \mathbf{10.31.} \quad 1\frac{1}{3} \text{кв.од.};$$

$$\mathbf{10.32.} \quad 5\frac{5}{24} \text{кв.од.}; \quad \mathbf{10.33.} \quad 4\frac{2}{3} \text{кв.од.}; \quad \mathbf{10.34.} \quad 24 \text{кв.од.}; \quad \mathbf{10.35.} \quad 10\frac{2}{3} \text{кв.од.}; \quad \mathbf{10.36.}$$

$$(4 - \ln 27) \text{кв.од.}; \quad \mathbf{10.37.} \quad \frac{112}{9} \sqrt{7 \text{кв.од.}}; \quad \mathbf{10.38.} \quad 5\frac{5}{24} \text{кв.од.} \quad \mathbf{10.40.} \quad 9 \text{кв.од.} \quad \mathbf{10.41.}$$

$$21\frac{1}{3} \text{кв.од.}; \quad \mathbf{10.42.} \quad \frac{1}{8} \text{кв.од.}$$

**РОЗДІЛ XI:**

**11.1.**  $y = -\frac{1}{2}e^{-2x} + C$ ;    **11.2.**  $y = -\frac{1}{5}\cos 5x + C$ ;    **11.3.**  $y = \frac{1}{2}\operatorname{arctg} \frac{x}{2} + C$ ;

**11.4.**  $y = -\frac{1}{2}\operatorname{ctg} 2x + C$ ;    **11.5.**  $y = \frac{x}{1-xC}$ ;    **11.6.**  $y = \ln\left(\frac{1}{C-e^x}\right)$ ;

**11.7.**  $y = \left(\frac{\sqrt[3]{x^8}}{8} + C\right)$ ;    **11.8.**  $y = -\frac{1}{2}\operatorname{ctg} 2x + C$ ;    **11.9.**  $y = C - \frac{1}{2\sqrt{x}}$ ;

**11.10.**  $y = -\frac{1}{1,5\sqrt{x} + C}$ ;    **11.11.**  $y = \frac{1}{(C-\sqrt{x})^2}$ ;    **11.12.**  $y = \frac{32}{\sqrt{(\sqrt[5]{x^8} + 4C)^5}}$ ;

**11.13.**  $y = \sqrt{\left(\frac{5}{10C - 2\sqrt[3]{x^5}}\right)^3}$ ;    **11.14.**  $y = \sqrt[3]{\left(\frac{9}{20}\sqrt[3]{x^5} + C\right)}$ ;    **11.17.**

$y = \sqrt{(\sqrt{1+x^2} + C)^2 - 1}$ ;    **11.18.**  $y = \sqrt{2\ln|x| - x^2 + 2C}$ ;    **11.19.**  $y = \lg\left|\frac{-2}{10^{2x} + C}\right|$ ;

**11.20.**  $y = \frac{C^2 \sin^2 x - 1}{2}$ ;    **11.21.**  $\operatorname{arctg} \frac{x}{y} = \ln(C\sqrt{x^2 + y^2})$ ;    **11.22.**  $Cy = y \ln y + x$ ;

**11.23.**  $y = x \operatorname{tg}(Cx)$ ;    **11.24.**  $2Cy = C^2 x^2 + 1$ ;    **11.25.**  $y = xe^{+Cx}$ ;    **11.26.**  
 $y - 2x = Cx^2(y + x)$ ;    **11.27.**  $y^2 + x^2 = Cy$ ;    **11.28.**  $y^2 = x^2(2\ln|Cx|)$ ;    **11.29.**

$x^2 = C^2 - 2Cy$ ;    **11.30.**  $Cy = e^{\frac{y}{x}}$ ;    **11.31.**  $y = e^{-x^2}\left(C + \frac{x^2}{2}\right)$ ;    **11.32.**  $y = e^{Cx}$ ;    **11.33.**

$y = (x + C)(1 + x^2)$ ;    **11.34.**  $y = Cx^2 + x^4$ ;    **11.35.**  $y = Ce^{-x} + x - 1$ ;    **11.36.**  
 $y = \sin x + C \cos x$ ;    **11.37.**  $y = e^x(\ln|x| + C)$ ;    **11.38.**  $xy = C - \ln|x|$ ;    **11.39.**

$y = x(C + \sin x)$ ;    **11.40.**  $y = e^x(x + C)$ ;    **11.41.**  $y = \frac{4x}{x \ln|Cx|}$ ;

**11.42.**  $y = \sqrt{\frac{1}{x^2 + Ce^{2x^2}} + \frac{1}{2}}$ ;    **11.43.**  $y = \frac{4x}{\ln|x| + 1 + xC}$ ;    **11.44.**  $y = -\frac{1}{2}(1 + y^2)$ ;    **11.45.**

$y = \frac{4x}{1 + \ln|y| + Cy}$ ;    **11.51.**  $y = \sqrt{x^2 + Cx}$ ;    **11.52.**  $3xy + 2x^2 + y^3 = C$ ;    **11.53.**

$4x^2 + xy^2 + \frac{5}{4}y^4 = C$ ;    **11.54.**  $xe^y + ye^x = C$ ;    **11.55.**  $x + \frac{1}{3}\sqrt{(x^2 + y^2)^3} - \frac{y^2}{2} - C$ ;

**11.65.**  $y = C_1 \operatorname{arctg} C_1 x + C_2$ ;    **11.66.**  $y = e^x(x-1) + C_1 + C_2 x^2$ ;    **11.67.**  
 $y = C_1 \sin x + C_2 - x - \frac{\sin 2x}{2}$ ;    **11.68.**  $\frac{1}{3} \ln|3y+4| = C_1 x + C_2$ ;    **11.69.**  
 $y = 1 + \frac{1}{C_1 x + C_2}$ ;    **11.70.**  $y = C_1 \ln|x| + C_2$ ;    **11.71.**  $\ln|C_1 y + \sqrt{C_1^2 y^2 - 1}| = C_1(x + C_2)$ ;  
**11.77.**  $y = C_1 e^x + C_2 e^{-3x}$ ;    **11.78.**  $y = C_1 e^{-x} + C_2 x e^{-x}$ ;    **11.79.**  
 $y = C_1 \cos\sqrt{3x} + C_2 \sin\sqrt{3x}$ ;    **11.80.**  $y = e^{2x}(C_1 \cos x + C_2 \sin x)$ ;    **11.82.**  
 $y = C \ln^2 x - \ln x$ ;    **11.83.**  $y = e^{-x}(C_1 + C_2 x)$ ;    **11.84.**  $y = 4x + C_1 + C_2 e^{-x}$ ;    **11.85.**  
 $y = \frac{1}{2} + e^{-x}(C_1 \cos x + C_2 \sin x)$ ;    **11.86.**  $y = C_1 e^x + C_2 e^{-x} - 5x - 2$ ;    **11.87.**  
 $y = C_1 + C_2 e^{3x} + x^2$ ;    **11.88.**  $y = C_1 e^x + C_2 e^{-2x} - 3x^2 - 3x + 4,5$ ;    **11.89.**  
 $y = C_1 e^{-x} + C_2 e^{-x} + \frac{1}{21} e^{2x}$ ;    **11.90.**  $y = C_1 e^{-3x} + C_2 e^{-x} 4,5 e^{-3x}$ ;    **11.91.**  
 $y = e^{3x}((C_1 \cos 4x + C_2 \sin 4x) + \frac{1}{102}(14 \cos x + 5 \sin x))$ .

## РОЗДІЛ 12:

**12.11.**  $\frac{4}{3}$ ;    **12.12.** 2;    **8.13.**  $\frac{10}{21}$ ;    **12.14.**  $\frac{1}{9}$ ;    **12.15.**  $\frac{3}{2}$ ;    **12.16.** 3;    **12.17.** 2;    **12.18.**  $\frac{3}{4}$ ;  
**8.19.**  $\frac{1}{2}$ ;    **12.20.** 2;    **12.21.** не виконується;    **12.22.** виконується;    **12.23.**  
 виконується;    **12.24.** не виконується;    **12.25.** не виконується;    **12.26.**  
 виконується;    **12.28.** виконується;    **12.29.** виконується;    **12.30.** виконується;  
**12.31.** збіжний;    **12.32.** розбіжний;    **12.33.** розбіжний;    **12.34.** збіжний;    **12.35.**  
 збіжний;    **12.36.** збіжний;    **12.37.** збіжний;    **12.38.** збіжний;    **12.39.** збіжний;  
**12.40.** збіжний;    **12.41.** збіжний;    **12.42.** збіжний;    **12.43.** збіжний;    **12.44.**  
 розбіжний;    **12.45.** збіжний;    **12.46.** збіжний;    **12.47.** збіжний;    **12.48.** розбіжний;  
**12.49.** розбіжний;    **12.50.** збігається неабсолютно;    **12.51.** збігається  
 неабсолютно;    **12.52.** збігається абсолютно;    **12.53.** збігається неабсолютно.

