

Alpha Individual Ciphering Solutions

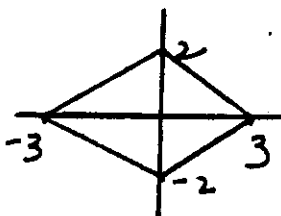
① $\frac{x^2}{9} + \frac{y^2}{4} = 1$

Rhombus

$$A = \frac{1}{2} d_1 d_2$$

$$= \frac{1}{2} \cdot 6 \cdot 4$$

$$= 12$$



12

② $f(x) = \frac{1}{2}x^2 - \frac{1}{3}x + \frac{1}{6}$

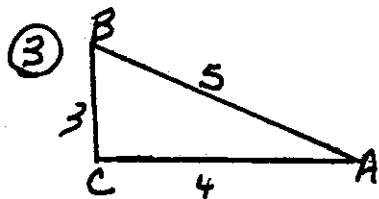
$\frac{1}{9}$

$$x = \frac{\frac{1}{3}}{2 \cdot \frac{1}{2}} = \frac{1}{3}$$

$$y = \frac{1}{2} \cdot \frac{1}{9} - \frac{1}{9} + \frac{1}{6}$$

$$= \frac{1}{18} - \frac{2}{18} + \frac{3}{18}$$

$$= \frac{1}{9}$$



$$\sin A + \sin 2B + \sin 3C$$

$\frac{14}{25}$

$$\frac{3}{5} + 2 \cdot \frac{3}{5} \cdot \frac{4}{5} + \sin 270^\circ$$

$$\frac{15 + 24 - 25}{25} = \frac{14}{25}$$

④ $\sum_{k=1}^4 = (1+i) + (1+i)^2 + (1+i)^3 + (1+i)^4$

-25

$$= 1 + 3i + (1+i)(2i) + 4i^2$$

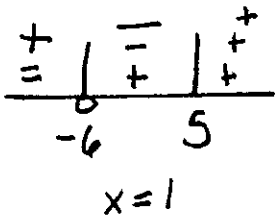
$$= 1 + 3i + 2i - 2 - 4$$

$$= -5 + 5i$$

$$a = -5 \quad b = 5$$

$$ab = -25$$

$$\textcircled{5} \frac{x-5}{x+6} \leq 0$$



$$\begin{aligned} -8 &\leq x-7 \leq 8 \\ -1 &\leq x \leq 15 \\ x &= 1 \end{aligned}$$

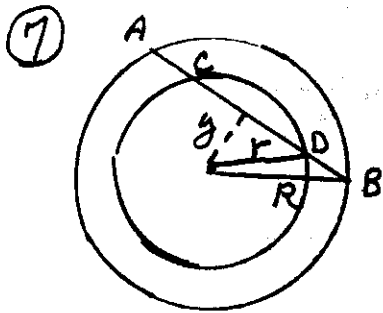
$$\begin{aligned} x+9 &\geq 10 \text{ or } x+9 \leq -10 \\ x &\geq 1 \text{ or } x \leq -19 \end{aligned}$$

$$\begin{aligned} \log x &< 1 \\ x &< 10 \\ x &= 1 \end{aligned}$$

1

$$\begin{aligned} \textcircled{6} R\pi &= \frac{\cos \pi + [\pi]}{[\pi]^2} \\ &= \frac{-1 + 3}{9} \\ &= \frac{2}{9} \end{aligned}$$

$\frac{2}{9}$



$$\begin{aligned} y^2 + (2\sqrt{2})^2 &= r^2 \\ y^2 + (6\sqrt{2})^2 &= R^2 \\ 72 - 8 &= R^2 - r^2 \\ 64 &= (R+r)(R-r) \\ 2 &= R-r \\ 32 &= R+r \\ 30 &= 2r \\ r &= 15 \end{aligned}$$

15

$$\begin{aligned} \textcircled{8} & \left[\log_2 \left(2^{10} \cdot 2^{\frac{5}{2}} \right) \right]^{-\frac{3}{2}} = \\ & \left[\log_2 \left(2^{\frac{25}{2}} \right) \right]^{-\frac{3}{2}} = \\ & \left[\frac{25}{2} \right]^{-\frac{3}{2}} = \\ & \left(\frac{16}{25} \right)^{\frac{3}{2}} = \frac{64}{125} \end{aligned}$$

$\frac{64}{125}$

$$\textcircled{9} \quad \frac{x}{5} + \frac{y}{-12} = 1 \quad \text{pt}(4, -5)$$

$$12x - 5y = 60$$

$$d = \frac{|ax^* + by^* + c|}{\sqrt{a^2 + b^2}}$$

$$d = \frac{|12 \cdot 4 + (-5)(-5) + (-60)|}{\sqrt{12^2 + (-5)^2}}$$

$$= \frac{13}{13} = 1$$

$$\textcircled{10} \quad P(x) = x^4 + 8x^3 + 12x^2 + Ax + B$$

| | | | | | | |
|----|---|----|-----|------|---------|-----|
| -4 | 1 | 8 | 12 | A | B | -96 |
| | | -4 | -16 | 16 | -4A-64 | |
| -4 | 1 | 4 | -4 | A+16 | B-4A-64 | |
| | | -4 | 0 | +16 | | |
| | 1 | 0 | -4 | A+32 | | |

$$A+32=0$$

$$A=-32$$

$$B-4A-64=0$$

$$B=-128+64$$

$$B=-64$$

$$A+B=-96$$

⑪

$$\frac{{}^3C_2 \cdot {}^5C_2 + {}^3C_3 \cdot {}^5C_1}{{}^8C_4} = \frac{3 \cdot 10 + 1 \cdot 5}{\frac{8 \cdot 7 \cdot 6 \cdot 5}{1 \cdot 2 \cdot 3 \cdot 4}} = \frac{35}{70} = \frac{1}{2}$$

$$\begin{aligned} \textcircled{12} \quad a_1 + 3 + a_3 &= -1 \longrightarrow a_1 + a_3 = -4 \\ 3 + a_3 - 1 &= a_5 \longrightarrow a_3 - a_5 = -2 \\ a_3 - 1 + a_5 &= a_6 \longrightarrow \begin{cases} a_3 + a_5 - a_6 = 1 \\ a_5 + a_6 = 15 \end{cases} \\ -1 + a_5 + a_6 &= 14 \end{aligned}$$

6

$$\begin{cases} a_3 + 2a_5 = 16 \\ a_3 - a_5 = -2 \\ 3a_5 = 18 \\ a_5 = 6 \end{cases}$$

$$\begin{aligned} \textcircled{13} \quad \text{Let } a &= x^{\frac{1}{2}} \\ 3a^3 + 8a^2 - 31a + 20 &= 0 \\ \begin{array}{r|rrrr} 1 & 3 & 8 & -31 & 20 & a=1 \\ & & 3 & 11 & -20 & x^{\frac{1}{2}}=1 \\ \hline & 3 & 11 & -20 & 0 & x=1 \end{array} \end{aligned}$$

$$\frac{25}{9}$$

$$3a^2 + 11a - 20 = 0$$

$$(3a-4)(a+5) = 0$$

$$a = \frac{4}{3} \quad a = -5$$

$$x^{\frac{1}{2}} = \frac{4}{3}$$

$$x = \frac{16}{9}$$

$$\frac{16}{9} + 1 = \frac{25}{9}$$

$$\begin{aligned} \textcircled{14} \quad \begin{cases} x+y=7 \\ x^3+y^3=(x+y)^3+1260 \end{cases} \\ 7(x^2-xy+y^2) &= 7^3 + 1260 \end{aligned}$$

169

$$\begin{cases} x^2 - xy + y^2 = 49 + 180 \\ x^2 + 2xy + y^2 = 49 \end{cases}$$

$$3xy = -180$$

$$xy = -60$$

$$x^2 + 2(-60) + y^2 = 49$$

$$x^2 + y^2 = 169$$