

In each of the following "NOTA" stands for None of the Above.

1. If  $x^2 + y^2 = 4$  and  $xy = -8$ , find  $(x - y)^2$ .

- a. 8                      b. 12                      c. 16                      d. 20                      e. NOTA

2. If  $f(x) = ax + b$  where  $f(-3) = 7$  and  $f(4) = 5$ , find  $b$ .

- a. 43/7                      b. 25/6                      c. 27/7                      d. 23/6                      e. NOTA

3. If  $f(x) = \left(\frac{x-1}{x+1}\right)^2$ , then  $f\left(\frac{1}{x}\right) =$

- a.  $-f(x)$                       b.  $f(-x)$                       c.  $f(x)$                       d.  $f^{-1}(x)$   
e. NOTA

4. The value of  $y = 4 \ln e^{e^x}$  at  $x = 1$  is

- a.  $4e$                       b.  $4e^e$                       c.  $8 \ln 8$                       d. 4                      e. NOTA

5. If  $(6b^2 + pb + 36) \div (2b + 7) = 3b + 5 + \frac{r}{2b + 7}$  find  $r + p$ .

- a.  $-21/2$                       b. 12                      c. 31                      d. 32                      e. NOTA

6. Which of the following are roots of the equation  $x^2 - 2kx = -9$ ?

I.  $k + \sqrt{k-3}$                       II.  $k + \sqrt{k^2 - 9}$                       III.  $k - \sqrt{k^2 - 9}$

- a. I only                      b. II only                      c. I and II only                      d. II and III only                      e. NOTA

7. Solve for  $x$ :  $\frac{2x-8}{x} < \frac{4}{x}$

- a.  $x < 6$                       b.  $0 < x < 6$                       c.  $-6 < x < 6$                       d.  $1 < x < 6$                       e. NOTA

8. A jar contains four white tickets numbered 1, 2, 3, and 4, and three red tickets numbered 1, 2, and 3. What is the probability that one ticket drawn randomly has either an even number or is red?

- a.  $\frac{6}{7}$                       b.  $\frac{5}{7}$                       c.  $\frac{4}{7}$                       d.  $\frac{3}{7}$                       e. NOTA

9. If a rectangular plot of land were 1 rod narrower and 4 rods longer, its area would be the same. It would also be the same if it were 2 rods wider and 4 rods shorter. How many square rods are in the plot of land?

- a. 24                      b. 36                      c. 42                      d. 56                      e. NOTA

10. What is the period of the graph of  $y = 4 \cos^3 x \sin x - 4 \cos x \sin^3 x$ ?

- a.  $\frac{3\pi}{2}$                       b.  $\pi$                       c.  $\frac{\pi}{2}$                       d.  $\frac{\pi}{4}$                       e. NOTA

11. Find the sum of solutions on  $[0, 2\pi)$  of  $\cos 5x \cos 3x = \frac{1}{2} + \sin(-5x) \sin 3x$ .

- a.  $\frac{7\pi}{6}$                       b.  $2\pi$                       c.  $\frac{17\pi}{6}$                       d.  $4\pi$                       e. NOTA

12. Evaluate  $\sin[2 \operatorname{Arc} \cos(-\frac{3}{5})]$

- a.  $\frac{24}{25}$                       b.  $\frac{4}{5}$                       c.  $\frac{2}{5}$                       d.  $\frac{24}{25}$                       e. NOTA

13. If  $|x| < 1$  and  $\operatorname{Arc} \sin \frac{2x}{1+x^2} = \theta$ , find  $\tan \theta$ .

- a.  $\frac{2x}{1-x^2}$                       b.  $\frac{x}{1-x^2}$                       c.  $\frac{2x}{x^2-1}$                       d.  $\frac{2}{1-x^2}$                       e. NOTA

14. Find all complex numbers  $z$  that satisfy  $z(z+4i) = (z+i)(z-3i)$  where  $i = \sqrt{-1}$ .

- a.  $-i$                       b.  $-2i$                       c.  $-\frac{i}{2}$                       d.  $2i$                       e. NOTA

15. Which of the following is one of the 5th roots of  $1+i$ ?

- a.  $\sqrt{2} \operatorname{cis} 9^\circ$               b.  $\sqrt[10]{2} \operatorname{cis} 91^\circ$               c.  $\sqrt{2} \operatorname{cis} 225^\circ$               d.  $\sqrt[10]{2} \operatorname{cis} 153^\circ$               e. NOTA

16. The vertices of a triangle are located at  $(-4, -3)$ ,  $(2, 3)$ , and  $(5, -1)$ . Where do the medians intersect?

- a.  $\left(1, -\frac{1}{3}\right)$                       b.  $\left(\frac{7}{3}, -\frac{1}{3}\right)$                       c.  $\left(\frac{4}{3}, -\frac{2}{3}\right)$                       d.  $\left(1, -\frac{2}{3}\right)$                       e. NOTA

17. Which parabola has a focus at  $(2, 5)$  and a directrix of  $y = -1$ ?

- a.  $(x-2)^2 = 24(y-5)$   
b.  $(x-2)^2 = 12(y-2)$   
c.  $(y-5)^2 = 12(x-2)$   
d.  $(x-2)^2 = 8(y-2)$   
e. NOTA

18. Find the volume of the parallelepiped having  $\vec{u} = 3\vec{i} - 5\vec{j} + \vec{k}$ ,  $\vec{v} = 2\vec{j} - 2\vec{k}$ , and  $\vec{w} = 3\vec{i} + \vec{j} + \vec{k}$  as adjacent sides.

- a. 24                      b. 30                      c. 36                      d. 40                      e. NOTA

19. If  $3^x - 3^{x-2} = 16$ , find  $x$ .

- a.  $2 + \log_3 2$                       b.  $2 \log_3 2$                       c.  $2 + \log_3 4$                       d. 6                      e. NOTA