For each of the questions below, NOTA means none of the other answers provided is correct.

1. Find the positive value of x for which the reciprocal of $x+3$ is $x-3$.

A) 3 B) $\sqrt{10}$ C) $\sqrt{15}$
D) 4 E) NOTA

2. Find the coordinates of the vertices (on the major axis) of the ellipse $4x^2+y^2=64$

A) $(0,\pm 8)$ B) $(\pm 8,0)$ C) $(\pm 4,0)$
D) $(0,\pm 4)$ E) NOTA

3. If **A** is 80% of **B**, then **B** is what % of **A**?

A) 120% B) 125% C) 150%
D) 200% E) NOTA

4. Simplify the expression $(1+i)^6$. Where $i=\sqrt{-1}$.

A) $1-i$ B) $6+6i$ C) $-6i$
D) $-8i$ E) NOTA

5. If $x+\frac{1}{x}=5$, then what is the value of $x^2+\frac{1}{x^2}$?

A) 25 B) 27 C)23
D) 29 E) NOTA

6. I can wash the dishes after our Sunday family dinner in 30 minutes. 10 minutes after I start washing, my brother comes to help me. Working together we finish the job in 10 more minutes. How long would it take my brother, working alone, to do all of the dishes?

A) 10 minutes B) 20 minutes C) 30 minutes
D) 40 minutes E) NOTA

7. Find all solutions for the equation $\log_2 x+\log_2(x-4)=5$

A) $x=-4, x=8$ B) $x=4, x=-8$ C) $x=4$
D) $x=8$ E) NOTA

8. Find the sum of the solutions of the equation $3^{x^2}\cdot 9^{-x}=\left(\frac{1}{27}\right)^{16}$

A) -2 B) 2 C) 4
D) 14 E) NOTA

9. Find the product of the solutions of $|5-2x|=8$

A) -5 B) 0 C) $\frac{13}{4}$
D) 5 E) NOTA

10. A square is inscribed in a circle whose area is $100\pi \ in^2$. What is the difference between the area of the circle and the area of the square?

A) $100\pi - 100$ B) $100\pi - 150$ C) $100\pi - 200$
D) $100\pi - 250$ E) NOTA

11. For the equation $f(x) = x^3 + 2x^2 - 3x - 6$. Let A = the number of real roots of the function and B = the number of complex roots of the function. Find the product AB.

A) 0 B) 1 C) 3
D) 6 E) NOTA

12. Find the sum of the positive real roots of the function $f(x) = 10x^3 - 17x^2 - 5x + 12$

A) $\frac{3}{4}$ B) $\frac{3}{2}$ C) 2 D) $\frac{5}{2}$ E) NOTA

13. Solve the following inequality $6 \le 3|2x+1|$

A) $\left(-\infty, \frac{-3}{2}\right] \cup \left[\frac{1}{2}, \infty\right)$ B) $\left(-\infty, \frac{-1}{2}\right] \cup \left[\frac{3}{2}, \infty\right)$ C) $\left[\frac{-3}{2}, \frac{1}{2}\right]$
D) $\left[\frac{-1}{2}, 3\right]$ E) NOTA

14. Find the center of the ellipse $9x^2 + 4y^2 - 18x + 8y - 23 = 0$.

A) $(1,1)$ B) $(-1,-1)$ C) $(1,-1)$
D) $(-1,1)$ E) NOTA

15. What is the coefficient of the x^2 term of the expansion of $(2y - 3x)^5$?

A) -720 B) -120 C) 120
D) 720 E) NOTA

16. If $\log 2 = A, \log 3 = B$ and $\log 5 = C$. Then express $\log \frac{75}{8}$ in terms of A, B and C.

A) 2B + 3C - A B) B + 3C – 2A C) 2B + 3C - A
D) B + 2C – 3A E) NOTA

17. How many real zeros does the function $f(x) = x^3 - x^2 - 2x$ have?

A) 0 B) 1 C) 2
D) 3 E) NOTA

18. Find the solution set of $\frac{5}{x-3} < \frac{3}{1-x}$

A) $\left(-\infty, \frac{7}{4}\right) \cup (3, \infty)$ B) $(-\infty, -1) \cup \left(\frac{7}{4}, \infty\right)$

C) $(-\infty, 1) \cup \left(\frac{7}{4}, \infty\right)$ D) $(-\infty, 1) \cup (3, \infty)$

E) NOTA

19. The acme Soda Company sells 26,000 cans of soda monthly at \$0.50 per can. Research indicates that sales will decrease by 1000 cans per month for every nickel increase in price. What price will maximize revenues on the sales of soda for the Acme company?
A) \$0.60 B) \$0.70 C) \$0.80 D) \$0.90 E) NOTA

20. Gram randomly guesses all the answers on a ten question TRUE-FALSE quiz. What is the probability that he will answer at least 9 of the questions correctly?

A) $\frac{1}{1024}$ B) $\frac{9}{1024}$ C) $\frac{10}{1024}$

D) $\frac{11}{1024}$ E) NOTA

21. Which of the following is a polynomial having zeros of (3,0) , (-3,0) and (-2,0)?

A) $y = x^3 + 2x^2 - 9x - 18$ B) $y = x^3 - 2x^2 - 9x + 18$

C) $y = x^3 - 4x^2 - 3x + 18$ D) $y = x^3 + 3x^2 - 3x + 2$

E) NOTA

22. Beth has 74 coins in her coin jar consisting of nickels, dimes and quarters. The total value of coins in the jar is \$8.85. If the number of nickels and quarters combined is 4 more than the number of dimes, then how many quarters does she have?
A) 12 B) 17 C) 20 D) 35 E) NOTA

23. Write the decimal number 324 in octal (base 8) notation.

A) 504_8 B) 534_8 C) 602_8

D) 604_8 E) NOTA

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

A) $\frac{x}{(2x-3)(x-2)}$ B) $\frac{2}{(2x-3)(x-2)}$

C) $\frac{-2}{(2x-3)(x-2)}$ D) $\frac{x+2}{(2x-3)(x-2)}$

E) NOTA

25. Evaluate $\sqrt{42+\sqrt{42+\sqrt{42+\sqrt{42+\sqrt{42+\ldots}}}}}$

A) 6 B) 7 C) 8

D) cannot be determined E) NOTA

26. A 10 foot tall piece of bamboo snaps and its tip falls 3 feet from its base. This now forms a right triangle. How tall is the vertical side of this right triangle?

A) $4\frac{11}{20}$ B) $5\frac{9}{20}$ C) $6\frac{1}{15}$ D) $6\frac{11}{15}$

E) NOTA

27. Solve for n in the equation $\frac{(n+1)!}{(n-1)!}=90$, where n is an integer greater than 1.

A) 8 B) 9 C) 10 D) 11 E) NOTA

28. Which of the following is the equation of an ellipse with one vertex at (6,0), one focus at (-4,0) and a center at the origin?

A) $\frac{x^2}{16}+\frac{y^2}{20}=1$ B) $\frac{x^2}{20}+\frac{y^2}{36}=1$ C) $\frac{x^2}{36}+\frac{y^2}{20}=1$

D) $\frac{x^2}{20}+\frac{y^2}{16}=1$ E) NOTA

29. Find the sum of the coordinates of the solution to the following system of equations:

$x + 4y = -5$

$8x - y = -7$

A) - 4 B) – 2 C) 0

D) 2 E) NOTA

30. Solve for x: $(x^2-10x+25)^{-1/2}=8$

A) $\frac{1}{8},\frac{7}{8}$ B) $\frac{13}{8},\frac{39}{8}$ C) $\frac{39}{8},\frac{41}{8}$

D) $\frac{41}{8},\frac{53}{8}$ E) NOTA