1. Simplify: $\dfrac{\frac{15}{5}}{1-\frac{1}{2}}$.

   A. 2/3 B. 2 C. 3/2 D. 6 E. None of these.

2. Factor: $16x^2 - 4y^8$

   A. $(4x - y^2)(4x + y^2)$ B. $(4x - 2y^4)^2$ C. $4(2x - y^4)(2x + y^4)$ D. $4(2x - y^2)$ E. None of these.

3. Simplify: $\left(\dfrac{4a^4b^8}{c^{-2}}\right)^{-1/2}$. (All letters denote positive real numbers.)

   A. $\dfrac{1}{2a^2b^4c}$ B. $\dfrac{2a^2b^4}{c}$ C. $\dfrac{a^4b^3}{16c^2}$ D. $\dfrac{c}{2a^2b^4}$ E. None of these..

4. Subtract and simplify: $\dfrac{3x}{3x+1} - \dfrac{x}{x-2}$.

   A. $\dfrac{2x^2-1}{(3x+1)(x-2)}$ B. $\dfrac{-3x^2}{(3x+1)(x-2)}$ C. $\dfrac{-7x}{(3x+1)(x-2)}$ D. $\dfrac{2x}{(3x+1)(x-2)}$
   E. None of these.

5. Divide and simplify: $\dfrac{x-2}{x^2-2x-3} \div \dfrac{x^2-x-2}{x^2-9}$.

   A. $\dfrac{(x-2)^2}{(x-3)^2(x+3)}$ B. $\dfrac{x+3}{(x+1)^2}$ C. $\dfrac{x+3}{x+1}$ D. $\dfrac{1}{x+3}$ E. None of these

6. A job takes 4 hours for two people working together. If one person works alone he can do the job in 6 hours. How long will it take the other person working alone to complete the job?
   A. 4 hrs. B. 6 hrs. C. 8 hrs. D. 10 hrs. E. None of these.

7. Write without negative exponents: $\dfrac{xy^{-1}}{(x+y)^{-1}}$.

   A. $\dfrac{x(x+y)}{y}$ B. $\dfrac{x^2}{x+y}$ C. $\dfrac{x+y}{xy}$ D. $\dfrac{xy}{x+y}$ E. None of these.

8. Simplify by rationalizing the denominator: $\dfrac{\sqrt{3}}{2+\sqrt{3}}$.

   A. $\dfrac{1}{2}$ B. 2 C. $2\sqrt{3}-3$ D. $\sqrt{3}+2$ E. $\dfrac{2\sqrt{3}-3}{7}$

9. Let x and y be two consecutive positive integers such that x is less than y and the difference of their squares is 145. Find x.
   A. 73 B. 72 C. 12 D. 8 E. None of these.

10. If $A = P(1 + rt)$, then $t =$
    A. $\dfrac{A-P}{r}$ B. $A - P$ C. $\dfrac{A-P}{P}$ D. $\dfrac{A}{P}$ E. None of these.

11. A truck enters a freeway traveling 40 mph. One hour later a car enters the same freeway traveling 55 mph. After how many miles will the car overtake the truck?
    A. $146\frac{2}{3}$ miles B. $201\frac{2}{3}$ miles C. 120 miles D. $106\frac{2}{3}$ E. None of these.

12. A square of side x is inscribed in a circle. Express the area, A, of the circle as a function of x.
    A. $A = \frac{\pi}{2}x^2$ B. $A = x^2$ C. $A = \pi x^2$ D. $A = \frac{\pi}{4}x^2$ E. None of these.

13. Solve for p : $\dfrac{4}{2p-3}+\dfrac{10}{4p^2-9}=\dfrac{1}{2p+3}$

A. $p=-\dfrac{3}{2}$ B. $p=\dfrac{5}{6}$ C. There is no solution   D. $p=-\dfrac{25}{6}$ E. None of these.

14. How many ml of a 50% acid solution should be added to 40 ml of a 20% acid solution to obtain a solution that is 25% acid?

A. 10 ml   B. 8 ml   C. 6 ml   D. 4 ml   E. None of these

15. Solve for x : $x=\sqrt{14+5x}$.

A. $x=3, x=14$ B. $x=-2, x=7$ C. $x=-2$ D. $x=\dfrac{14}{3}$ E. None of these.

16. Find all solutions: $m^4-m^2-6=0$.

A. $m=2, 3$ B. $m=-2, \pm\sqrt{3}$ C. $m=\pm\sqrt{3}, \pm2i$ D. $m=\pm\sqrt{3}, \pm\sqrt{2}i$ E. None of these.

17. Solve the inequality and express the solution in terms of intervals: $3x-2>6x+1$

A. $(-\infty,-1)$ B. $(-1,1)$ C. $(-\infty,-1]$ D. $(-1,\infty)$ E. None of these.

18. Solve the inequality: $\mid 6-2x\mid\le 3$.

A. $x\ge\dfrac{3}{2}$ B. $x\le\dfrac{3}{2}$ C. $\dfrac{3}{2}\le x\le\dfrac{9}{2}$ D. $-\dfrac{9}{2}\le x\le-\dfrac{3}{2}$ E. None of these.

19. Find all values of k so that the solutions of the following equation are real numbers: $2x^2-4x+k=0$.

A. $k=2$ B. $k>2$ C. $k\ge 2$ D. $k\le 2$ E. None of these.

20. The base of a triangle is three inches more than its height. If each is increased by 3 inches the area is 14 square inches. Find the original base (b) and original height (h) in inches.

A. $b=4, h=1$ B. $b=9, h=6$ C. $b=8, h=5$ D. $b=7/2, h=l/2$ E. None of these.

21. Solve for x:

$$2x^2+y^2=1$$
$$x-y=1$$

A. $x=2/3$ B. $x=0, 2/3$ C. $x=-2/3$ D. $x=0, 3/2$ E. None of these.

22. If the point $(2,3)$ is midway between A and B and the point A has coordinates $(1,-2)$, find the coordinates of the point B.

A. $(1,5)$ B. $(3,1)$ C. $(3,8)$ D. $(3/2,1/2)$ E. None of these.

23. The slope of a line perpendicular to the line drawn is:
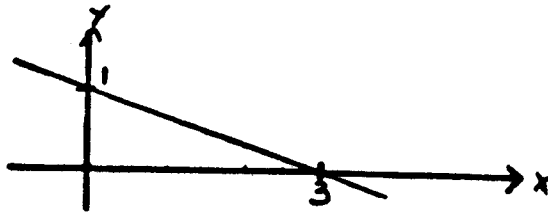
A. 1/3   B. $-1/3$ C. -3 D. 3   E. None of these.

24. If m varies directly as the product of x and y and inversely as z, find the constant of proportionality k if $m=3$ when $x=4, y=2$ and $z=6$.

A. $k=1/6$ B. $k=9/4$ C. $k=3$ D. $k=1/4$ E. None of these.

25. Give the equation of the line in slope-intercept form which is parallel to the line $2x-3y=7$ and contains the point $(4,-1)$.

A. $y=\dfrac{3}{2}x-7$ B. $y=-\dfrac{2}{3}x+\dfrac{5}{2}$ C. $y=\dfrac{2}{3}x-\dfrac{11}{3}$ D. $y=\dfrac{2}{3}x+\dfrac{14}{3}$ E. None of these.

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26. The equation for the circle shown is:
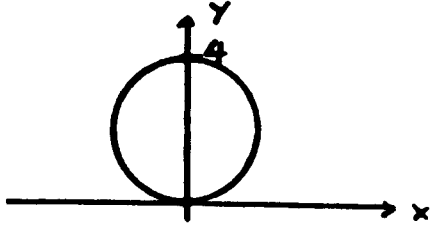
A. $x^2 + y^2 = 4$ B. $x^2 + y^2 - 4y = 0$ C. $x^2(y-2) = 4$ D. $x^2 + y^2 + 4y = 0$
E. $x^2 + y^2 + 4x + 4y - 8 = 0$

27. Determine $(g \circ f)(x)$ for the following functions: $f(x) = 1 - \sqrt{x}$ and $g(x) = 1/x$.
A. $-\sqrt{x}$ B. $1 - \sqrt{1/x}$ C. $1 - \sqrt{x}$ D. $\dfrac{1}{1 - \sqrt{x}}$ E. $1/\sqrt{x}$

28. If $f(x) = \dfrac{x}{x^2+1}$, find $\dfrac{1}{f(3)}$.
A. 3/10 B. 3/16 C. 16/3 D. 10/3 E. None of these.

29. The graph below could best be described by which equation?
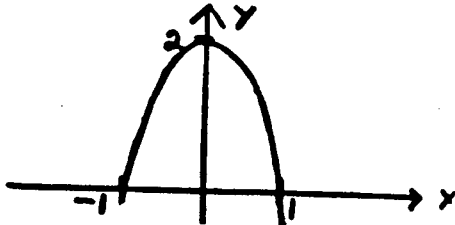
A. $y = 2x^2 + 2$ B. $y = -2x^2 + 2$ C. $y = -2x^2 - 2$ D. $y = 2x^2 - 2$ E. $y = -(x-2)^2$

30. The figure below most closely resembles the graph of which function?
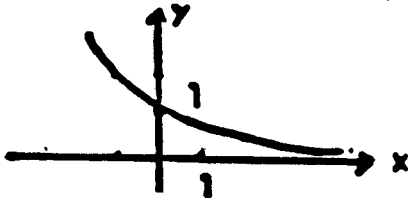
A. $y = (1/2)^x$ B. $y = 2^x$ C. $y = -2^x$ D. $y = -(1/2)^x$ E. $y = 1 - 2^x$

31. Express as one logarithm: $\log_b y^3 + \log_b y^2 - \log_b y^4$

A. $\log_b y^2$ B. $\log_b y$ C. $\log_b(y^3 + y^2 - y^4)$ D. $\log_b \dfrac{y^3 + y^2}{y^4}$ E. None of these.

32. Which are true of the function $f(x) = \log_a x$ if $a > 1$?
I. f is an increasing function. II. f has a as an x intercept. III. f has 1 as a y intercept.
IV. The domain of f is $(0, \infty)$. List all correct answers.

A. I, II and III B. I and II C. II and IV D. I and IV E. I and III

33. Which of the following is equivalent to $\log\left(\dfrac{432}{\sqrt{.095}\,\sqrt[3]{72.1}}\right)$?
A. $\log 432 - \frac{1}{2}\log .095 - 3\log 72.1$ B. $\log 432 - \frac{1}{2}\log .095 - \frac{1}{3}\log 72.1$
C. $\log 432 - 2\log .095 + 3\log 72.1$ D. $\log 432 - \frac{1}{2}\log .095 + \frac{1}{3}\log 72.1$
E. $\log 432 - 2\log .095 - 3\log 72.1$

34. Solve for x : $3^{x-5} = 4$.

    A. $x = \log 4 + 5\log 3$ B. $x = 5 + \log(4/3)$ C. $x = 5 + \dfrac{\log 4}{\log 3}$

    D. $x = 5 + \log 4$ E. $x = \dfrac{5 + \log 4}{\log 3}$

35. Solve for x : $\log_3 \sqrt{2x + 3} = 2$.

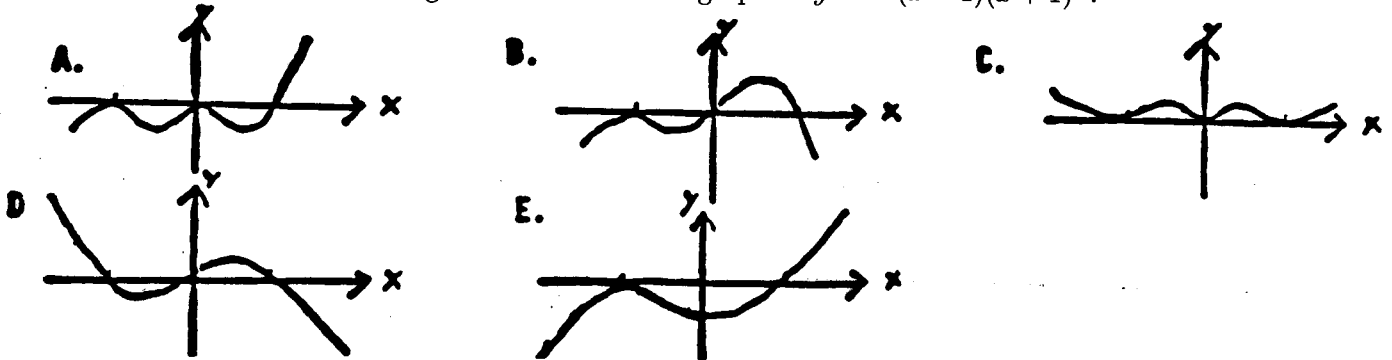   A. $x = 5/2$ B. $x = 3/2$ C. $x = 39$ D. $x = 17$ E. $x = 3$

36. Given that $\log_3 m = 8, \log_3 n = 10$ and $\log_3 p = 6$. Calculate $\log_3 \left(\dfrac{\sqrt{mn}}{p^3} \right)$.

    A. -9 B. $\dfrac{2\sqrt{5}}{27}$ C. 22 D. -56 E. -4

37. The graph of $y = 2 + 2^x$ crosses the y-axis at

    A. 0 B. 1 C. 2 D. 3 E. 4

38. Which of the following looks most like the graph of $y = x^2(x - 1)(x + 1)^2$?

39. Which set of equations below has no solution?

    A. $\begin{array}{l} 2x + 3y = 8 \\ 3x - 2y = 4 \end{array}$ B. $\begin{array}{l} 3x + 4y = 5 \\ 6x + 8y = 10 \end{array}$ C. $\begin{array}{l} 2x - 3y = 4 \\ -4x + 6y = 3 \end{array}$ D. $\begin{array}{l} x - 4y = 6 \\ 2x - 4y = 6 \end{array}$ E. $\begin{array}{l} 3x - 2y = 4 \\ 6x + 4y = 8 \end{array}$

40. Determine where the two lines $x + 4y = 3$ and $2x - 6y = 8$ intersect.

    A. $x = \frac{-12}{5}, y = \frac{6}{5}$ B. $x = \frac{1}{3}, y = \frac{4}{9}$ C. $x = \frac{2}{7}, y = \frac{5}{7}$ D. $x = \frac{1}{8}, y = \frac{2}{5}$ E. None of these.

41. The value of a rare book is increasing linearly. It was worth \$54 in 1981 and \$62 in 1983. What is the formula for the value (v) of the book t years after 1980?

    A. $v = 50 + 4t$ B. $v = 48 + 3t$ C. $v = 50 + 3t$ D. $v = 51 + 4t$ E. None of these.

42. If $f(x) = x^2 - 2x + 4$ then $\dfrac{f(x + h) - f(x)}{h} =$

    A. $2x + h - 2$ B. $x + 2h - 2$ C. $x + 2h + 2$ D. $2x - h - 2$ E. $2x - h + 2$.

43. An aquarium in the shape of a rectangular box is to have a height of 1.5 feet and a volume of 6 cubic feet. Let x denote the length of the base and y the width of the base. Express y as a function of x.

    A. $y = 1.5x$ B. $y = \frac{4}{x}$ C. $y = x^2$ D. $y = \frac{6}{x}$ E. $y = 9x$

44. If $\log_x 2 = 5$, solve for x. Give you answer correct to four decimal places. (Hint: Change to exponential notation.)

    A. 2.2361 B. 1.4142 C. 0.6990 D. 1.1487 E. 0.3010

SOLUTION

1. D; 2. C; 3. A; 4. C; 5. B; 6. E [12 hrs.]; 7. A; 8. C; 9. B; 10 E [$(A-P)/Pr$]; 11. A; 12 A; 13 D; 14. B; 15. E [$x = 7$]; 16. D; 17. A; 18. C; 19. D; 20. A; 21. B; 22. C; 23. D; 24. B; 25. C; 26. B; 27. D; 28. D; 29. B; 30. A; 31. B; 32. D; 33. B; 34. C; 35. C; 36. A; 37. D; 38. A; 39. C; 40. E[$x = \frac{25}{7}, y = \frac{-1}{7}$]; 41. A; 42. A; 43. B. 44. D