1)   Simplify: $2x - 3y + 2[3x - (2y + 5x)]$

      $A. -2x - 7y$ $B. 18x - 7y$ $C. -30x^2 - 12xy + 2x - 3y$

      $D. -2x - 5y$ $E.$ None of these

2)   Which number is irrational?

      $A. -\frac{2}{3}$ $B. 3.4848...$ $C. \sqrt{7}$ $D. 5.12$ $E. -3$

3)   The slope of a line passing through the two points $(1, 3)$ and $(3, -2)$ is

      $A. \frac{1}{4}$ $B. \frac{1}{2}$ $C. -\frac{2}{5}$ $D. -2$ $E.$ None of these

4) $\left(\frac{1}{2}x - 5\right)^2 =$

      $A. \frac{1}{4}x^2 + 5x - 25$ $B. \frac{1}{4}x^2 - 5x + 25$ $C. \frac{1}{4}x^2 - \frac{5}{2}x - 25$

      $D. \frac{1}{4}x^2 - \frac{5}{2}x + 25$ $E.$ None of these

5)   The slope of a line perpendicular to the line with equation $3x - 5y + 4 = 0$ is

      $A. -\frac{3}{5}$ $B. \frac{3}{5}$ $C. \frac{5}{3}$ $D. -\frac{5}{3}$ $E.$ None of these

6)   Solve the inequality, $3x - 7 > 5x + 6$. Write solution using interval notation.

      $A. \left(-\infty, -\frac{13}{2}\right)$ $B. \left(-\frac{13}{2}, \infty\right)$ $C. \left(-\infty, -\frac{1}{2}\right)$ $D. \left(-\frac{1}{2}, \infty\right)$ $E.$ None of these

7)   Solve for x: $\frac{1}{3}x - 1 = \frac{1}{5}x + 2$

      $A. x = \frac{45}{2}$ $B. x = \frac{2}{15}$ $C. x = \frac{2}{5}$ $D. x = \frac{15}{2}$ $E.$ There is no solution.

8)   Find the distance between $P(4, -3)$ and $Q(2, 1)$.

      $A. 20$ $B. 2\sqrt{5}$ $C. 2\sqrt{10}$ $D. 40$ $E. \sqrt{6}$

9)   Solve for x: $\sqrt{3x + 7} = x + 1$

      $A. x = 3, x = -2$ $B. x = 3$ $C. x = \frac{3}{2} + \frac{\sqrt{33}}{2}$ $D. x = 2, -3$ $E.$ There is no solution.

10)   Solve: $|3x - 7| \geq 5$

      $A. \left(-\infty, -\frac{2}{3}\right] \cup [4, \infty)$ $B. \left[\frac{2}{3}, \infty\right)$ $C. (-\infty, -4] \cup \left[\frac{2}{3}, \infty\right)$

      $D. [-4, \infty)$ $E. \left(-\infty, \frac{2}{3}\right] \cup [4, \infty)$

11)   If y varies inversely as x and $y = 18$ when $x = 6$, find x when $y = 2$.
       A. $x = 54$ B. $x = \frac{1}{54}$ C. $x = \frac{2}{3}$ D. $x = \frac{3}{2}$ E. None of these

12)   Simplify: $\left(\dfrac{a^2 b^{-3}}{a^{-3} b^2}\right)^{-2}$

       A. $\dfrac{b}{a}$ B. $\left(\dfrac{a}{b}\right)^2$ C. $\left(\dfrac{a}{b}\right)^6$ D. $\left(\dfrac{b}{a}\right)^{10}$ E. None of these

13)   Divide and simplify: $\dfrac{x^2 - 2x + 1}{x^2 - 1} \div \dfrac{x^2 - 3x + 2}{x - 2}$

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

14)   Which of the following is a factor of $x^3 + x^2 - ax^2 - ax$?
       A. $x - a$ B. $x - 1$ C. x^2 D. ax E. None of these

15)   Combine terms and simplify: $12\sqrt{45} - 8\sqrt{80}$
       A. $-20\sqrt{5}$ B. $-4\sqrt{35}$ C. $4\sqrt{5}$ D. $8\sqrt{5}$ E. None of these

16)   Factor: $16x^2 - 4y^8$
       A. $\left(4x - y^2\right)\left(4x + y^2\right)$ B. $\left(4x - 2y^4\right)^2$ C. $4\left(2x - y^4\right)\left(2x + y^4\right)$
       D. $4\left(2x - y^2\right)$ E. None of these

17)   Solve the system of equations for x: $\begin{cases} 3x + y = -1 \\ x + 2y = 3 \end{cases}$
       A. $x = -2$ B. $x = 2$ C. $x = 1$ D. $x = -1$ E. None of these

18)   Solve for x: $2x^2 - 3x = 2$
       A. $x = -\frac{1}{2},\ x = -2$ B. $x = -\frac{3}{2},\ x = 2$ C. $x = \frac{3}{2},\ x = 2$
       D. $x = \frac{1}{2},\ x = -2$ E. None of these

19)   Solve for x: $\dfrac{1}{x-4} - \dfrac{1}{x-2} = \dfrac{1}{4}$
       A. $x = 4,\ x = 2$ B. $x = 0,\ x = 2$ C. $x = 0,\ x = 6$ D. $x = 6,\ x = 4$ E. None of these

20)   Rationalize the denominator: $\dfrac{2}{3 - \sqrt{5}}$

$A. \dfrac{3}{2} - \dfrac{\sqrt{5}}{2}$ $B. \dfrac{3}{7} + \dfrac{\sqrt{5}}{7}$ $C. \dfrac{3}{2} + \dfrac{\sqrt{5}}{2}$ $D. 6 + \dfrac{\sqrt{5}}{21}$ E. None of these

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

$A. \; y = \dfrac{3}{2}x - 4$ $B. \; y = -\dfrac{2}{3}x + \dfrac{1}{3}$ $C. \; y = \dfrac{2}{3}x - \dfrac{7}{3}$ $D. \; y = \dfrac{2}{3}x + \dfrac{8}{3}$ E. None of these

22)   One solution of $2x^2 + 2x - 1 = 0$ is

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

23)   Expand the logarithm expressing in terms of $\log x$, $\log y$, and $\log z$: $\log\left(\sqrt{\dfrac{z^3}{xy}}\right)$

$A. \left(\dfrac{3\log z}{(\log x)(\log y)}\right)^{\frac{1}{2}}$ $B. \dfrac{3}{2}\log z - \dfrac{1}{2}\log x - \dfrac{1}{2}\log y$ $C. (3\log z - \log x - \log y)^{\frac{1}{2}}$

$D. \dfrac{1}{2}\left(\dfrac{3\log z}{(\log x)(\log y)}\right)$ $E. \dfrac{3}{2}\log z - \dfrac{3}{2}\log x + \dfrac{3}{2}\log y$

24) $\left(\dfrac{1}{8}\right)^{-\frac{2}{3}} =$

$A. \dfrac{1}{4}$ $B. \, 4$ $C. \, 16\sqrt{2}$ $D. \dfrac{1}{16\sqrt{2}}$ E. None of these

25) $\log_2\left(\dfrac{1}{16}\right) =$

$A. \dfrac{1}{4}$ $B. \, -\dfrac{1}{4}$ $C. \, 4$ $D. \, -4$ E. None of these

26)   Condense this expression to a single logarithm and simplify: $\log_a 7 - \log_a 20 + 2\log_a 4$

$A. \log_a\left(\dfrac{28}{5}\right)$ $B. \log_a 3$ $C. \log_a\left(\dfrac{7}{10}\right)$ $D. \log_a 6$ E. None of these

27)   If $2^{x+1} = 3$, then find x. (Give your answer correct to 2 decimal places.)
      $A. \, 0.41$ $B. \, 0.50$ $C. \, 0.56$ $D. \, 0.60$ $E. \, 0.58$

28)   The sum of two positive numbers is $\dfrac{3}{2}$ and their difference is $\dfrac{1}{2}$. Find the smaller of the two numbers.

$A. \dfrac{1}{2}$ $B. \dfrac{3}{2}$ $C. \, 1$ $D. \dfrac{1}{4}$ E. None of these

29)   Bob is 25 years older than his daughter Jane. Three years ago, Bob was twice as old as Jane. If x represents Jane's present age, which equation could be used to find x?
        A. $x+22=2(x-3)$ B. $x+25=2x$ C. $x+22=2x$
        D. $x+25=2(x-3)$ E. None of these

30)   Paul can paint a room in 5 hours. Sally can paint the same room in 3 hours. How long will it take for them to paint the room if they work together?
        A. 4 hours   B. $1\frac{7}{8}$ hours   C. 3 hours   D. $\frac{8}{15}$ hour   E. None of these

31)   The base of a triangle is 5 inches less than its altitude. The area is 18 square inches. Find the base of the triangle.
        A. 9 in.   B. 6 in.   C. 4 in.   D. 34 in.   E. None of these

32)   At 2:00 P.M. two cars start toward each other from towns 240 miles apart. If the rate of one car is 10 mph faster than the other, find the rate of the faster car if the two cars meet at 5:00 P.M.?
        A. 45 mph   B. 35 mph   C. 40 mph   D. 30 mph   E. None of these

33)   A computer dealer marks up all his merchandise 55% over his cost. If he sells a 'mouse' for $30.00, how much did he pay for it?
        A. $16.50   B. $24.55   C. $19.35   D. $13.50   E. $20.69

34)   Two investments are made totaling $4800. Part of the money is invested at 8% and the rest at 9%. In the first year they yield $412 in simple interest. How much money is invested at 8%?
        A. $1820   B. $2980   C. $2600   D. $2000   E. None of these

35)   At what simple interest rate will $2000 accumulate to $3480 in 8 years?
        A. 9.25%   B. 5.75%   C. 18.5%   D. 8.5%   E. None of these

36)   The equation for the circle with center $(-3,2)$ and radius 5 is:
        A. $(x-3)^2+(y+2)^2=25$ B. $(x+3)^2+(y-2)^2=25$ C. $(x-3)^2+(y-2)^2=5$
        D. $(x-3)^2+(y+2)^2=5$ E. None of these

37)   The graph at the right can best be described by which piecewise function?
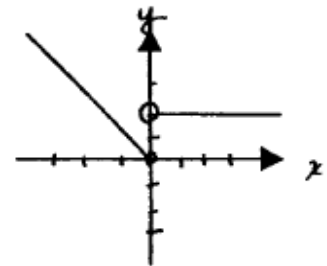
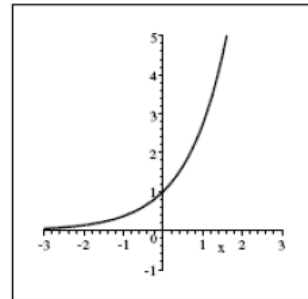   A. $f(x)=\begin{cases} x & x\le 0 \\ x+2 & x>0 \end{cases}$ B. $f(x)=\begin{cases} -x & x\le 0 \\ 2x & x>0 \end{cases}$

        C. $f(x)=\begin{cases} x-2 & x\le 0 \\ 2x & x>0 \end{cases}$ D. $f(x)=\begin{cases} -x & x\le 0 \\ 2 & x>0 \end{cases}$

   E. None of the above

38) Multiply and simplify completely: $(3i-2)(2i-5)$
   A. $4+19i$ B. $-16-19i$ C. $4-19i$ D. $-16+19i$ E. None of these

39) For $f(x)=\dfrac{8}{x-4}$, find $f(-2)$.
   A. $f(-2)=-4$ B. $f(-2)=\frac{4}{3}$ C. $f(-2)=-\frac{4}{3}$ D. $f(-2)=-2$ E. None of these

40) Let $f(x)=4-x$ and $g(x)=x^2+1$. Find $(f\circ g)(5)$.
   A. $(f\circ g)(x)=26$ B. $(f\circ g)(x)=234$ C. $(f\circ g)(x)=-22$
   D. $(f\circ g)(x)=2$ E. None of these

41) For a one-to-one function, f, given by $f(x)=\dfrac{1}{x+3}$, determine $f^{-1}(x)$.

   A. $f^{-1}(x)=\dfrac{1-3x}{x}$ B. $f^{-1}(x)=\dfrac{1}{3-x}$ C. $f^{-1}(x)=3-x$

   D. $f^{-1}(x)=\dfrac{x+1}{3}$ E. None of these

42) The area of a rectangular patio is given by the function $A(x)=-x^2+10x+200$, where x is the width measured in feet. Find the maximum area of the patio.
   A. $245\ ft^2$ B. $5\ ft^2$ C. $275\ ft^2$ D. $225\ ft^2$ E. None of these

43) When a certain make of car is purchased for \$18,000, its trade-in value t years after purchase is given by $V(t)=18000(0.85)^t$ dollars. Find the car's trade-in value after 4 years, rounded to the nearest dollar.
   A. \$8604   B. \$5480   C. \$9396   D. \$6120   E. None of these

44) The graph at the right can best be described by which equation?
   A. $y=e^x+1$ B. $y=\ln x$ C. $y=e^x$
   D. $y=\left(\dfrac{1}{e}\right)^x$ E. $y=\ln(x+1)$

45) What amount invested today will accumulate to \$34,000 by the end of 8 years if it is invested at 8.5% compounded monthly? Give your answer correct to the nearest cent.
   A. \$17,702.76   B. \$20,238.09   C. \$66,951.16   D. \$15,186.83   E. \$17,266.32

46)   Maria Valdez is going to make quarterly deposits of $425 in a savings account. How
       much will she have after 12 years if the account pays 6% annual interest, compounded
       quarterly? Give your answer rounded to the nearest dollar.
       A. $20,400   *B.* $25,296   *C.* $41,687   *D.* $29,565   *E.* $32,659

47)   Find the payment required to repay a $20,000 loan over 5 years, with monthly payments
       at a 6% annual rate.
       A. $1237.51   *B.* $487.22   *C.* $1267.88   *D.* $386.66   *E.* None of these

48)   Simplify: $\sqrt{75x^2 y^3}$
       A. $5xy\sqrt{3xy}$ *B.* $5xy\sqrt{3y}$ *C.* $5y\sqrt{3x^2 y}$ *D.* $3xy\sqrt{25y}$ *E.* None of these

49)   The graph of $y = -x^2 + 2x - 1$ looks most like which of the following?

       A.   *B.*   *C.*   *D.*   *E.*
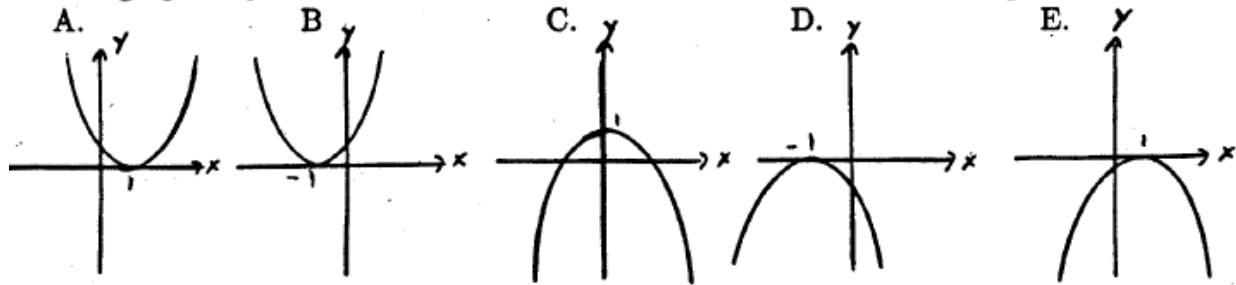
50)   Divide: $\dfrac{2-4i}{3+i}$

       A. $\dfrac{1}{5} + \dfrac{7}{5}i$ *B.* $\dfrac{5}{4} - \dfrac{7}{4}i$ *C.* $\dfrac{1}{5} - \dfrac{7}{5}i$ *D.* $\dfrac{2}{3} - 4i$ *E.* $\dfrac{5}{4} + \dfrac{7}{4}i$

51)   What number should be added to $x^2 + 26x$ in order to complete the square?
       A. 13   *B.* 169   *C.* 676   *D.* 52   *E.* None of these

52)   Use the graph at the right. Which statement is false?
       A. There is a relative maximum of 2.
       B. $f(2) = 0$
       C. There are 3 x-intercepts; 0, 2, and 4.
       D. The range of the function is [0, 4].
       E. The graph is decreasing on $(1,3)$.
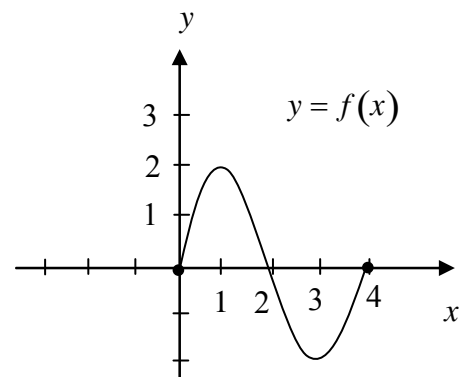
53)   What is the vertex of the parabola represented by $g(x) = -2x^2 + 8x + 1$?
       A. $(2,9)$ *B.* $(2,-9)$ *C.* $(-2,-23)$ *D.* $(-2,23)$ *E.* None of these

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54)   Solve: $\log(4) + \log(x-1) = \log(3x+5)$

        A. $x = 1$ *B*. $x = 6$ *C*. $x = 9$ *D*. $x = -1$ *E*. No solution

Answers:

1) A; 2) C; 3) E $\left(-\frac{5}{2}\right)$; 4) B; 5) D; 6) A; 7) A; 8) B; 9) B; 10) E; 11) A;

12) D; 13) B; 14) A; 15) C; 16) C; 17) D; 18) E $\left(x = -\frac{1}{2}, x = 2\right)$; 19) C; 20) C;

21) C; 22) E; 23) B; 24) B; 25) D; 26) A; 27) E; 28) A; 29) A; 30) B; 31) C;
32) A; 33) C; 34) D; 35) A; 36) B; 37) D; 38) C; 39) C; 40) C; 41) A; 42) D;
43) C; 44) C; 45) E; 46) D; 47) D; 48) B; 49) E; 50) C; 51) B; 52) D; 53) A;
54) C