Math 1010 Final Exam Version B
Fall Semester, 2002 Instructor_____

Name KEY ID verification _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve.

1) A boat can travel on a river 17 miles upstream in the same time it takes to travel 23 miles downstream. Find the speed of the current if the speed of the boat in still water is 20 miles per hour.

A) 60 mph B) 5 mph C) 3 mph D) 4 mph

	D	R	T
up	17	$20-R$	$\frac{17}{20-R}$
down	23	$20+R$	$\frac{23}{20+R}$

Because from $D=RT$, $T=\frac{D}{R}$

R = speed of current

SAME TIME:

$$\frac{17}{20-R} = \frac{23}{20+R}$$

$$\Rightarrow 17(20+R) = 23(20-R) \Rightarrow 340+17R = 460-23R$$

$$\Rightarrow 40R = 120 \Rightarrow R = 3 \text{ mph current}$$

Perform the indicated operation. Write the result in the form a + bi.

2) $\frac{28 - 3i}{2 - 3i}$

A) 6 – 5i B) 6 + 5i C) 5 – 6i D) 5 + 6i

$\frac{(28-3i)}{(2-3i)} \cdot \frac{(2+3i)}{2+3i} \Rightarrow \frac{56 + 84i - 6i - 9i^2}{4 + 6i - 6i - 9i^2} \Rightarrow \frac{56 + 84i - 6i + 9}{4 + 6i - 6i + 9} \Rightarrow \frac{65 + 78i}{13}$

$\Rightarrow \frac{65}{13} + \frac{78}{13}i \Rightarrow \boxed{5 + 6i}$

Model the problem with a linear equation.

3) When making a telephone call using a calling card, a call lasting 5 minutes cost $0.90. A call lasting 15 minutes cost $1.90. Let y be the cost of making a call lasting x minutes using a calling card. Write a linear equation that models the cost of a making a call lasting x minutes.

A) y = –0.1x + 1.4 B) y = 10x – $\frac{491}{10}$ C) y = 0.1x – 13.1 D) y = 0.1x + 0.4

LINEAR EQUATION ⇒ NEED 2 POINTS ⇒ $(x_1, y_1), (x_2, y_2)$ where x is time & y is $

SO $(5, .9), (15, 1.9)$

$\Rightarrow m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1.9 - .9}{15 - 5} = \frac{1}{10} \Rightarrow y - y_1 = m(x - x_1) \Rightarrow y - .9 = \frac{1}{10}(x - 5)$

$\Rightarrow y - .9 = .1(x - 5) \Rightarrow y - .9 = .1x - .5 \Rightarrow \boxed{y = 0.1x + 0.4}$

(+.9 +.9)

Divide.

4) $(-10x^3 - 31x^2 - 40x - 15) \div (5x + 3)$

A) $-2x^2 - 5$ B) $x^2 + 5x + 5$ C) $-2x^2 - 5x - 5$ D) $x^2 - 5x - 5$

$-2x^2 - 5x - 5$

$5x+3 \overline{)-10x^3 - 31x^2 - 40x - 15}$

$\pm 10x^3 \pm 6x^2$

$-25x^2 - 40x$

$\pm 25x^2 \pm 15x$

$-25x - 15$

$\pm 25x \pm 15$

So $\boxed{-2x^2 - 5x - 5}$

Find the center and the radius of the circle.

5) $x^2 + y^2 - 18x - 4y + 85 = 36$

A) (9, 2), r = 6 B) (–2, –9), r = 36 C) (2, 9), r = 6 D) (–9, –2), r = 36

$x^2 - 18x + 81 + y^2 - 4y + 4 = -49 + 81 + 4$

$\downarrow \frac{1}{2}$ $( )^2$ $\downarrow \frac{1}{2}$ $( )^2$

$(x - 9)^2 + (y - 2)^2 = 36$

opposites $\sqrt{}$

cen $(9, 2)$, $r = 6$

Divide. Simplify the answer.

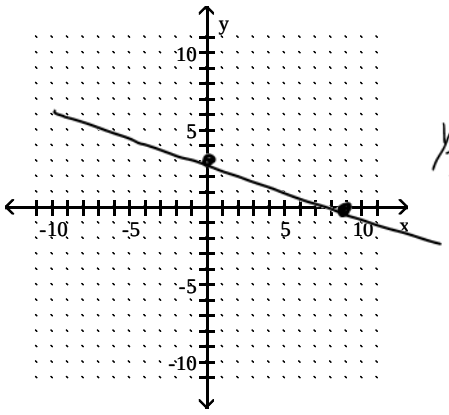
6) $\frac{3p - 3}{p} \div \frac{8p - 8}{3p^2}$

A) $\frac{9p}{8}$ B) $\frac{24p^2 + 48p + 24}{3p^3}$ C) $\frac{8}{9p}$ D) $\frac{9p^3 - 9p^2}{8p^2 - 8p}$

$\frac{3p-3}{p} \cdot \frac{3p^2}{8p-8} \Rightarrow \frac{3(p-1)}{p} \cdot \frac{3 \cdot p \cdot p}{8(p-1)} \Rightarrow \boxed{\frac{9p}{8}}$

Graph the linear function by finding x– and y–intercepts.

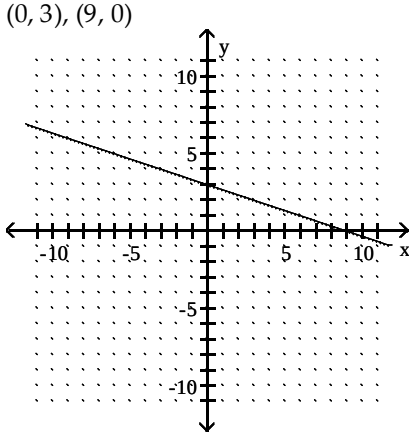
7) $y + \frac{1}{3}x = 3$



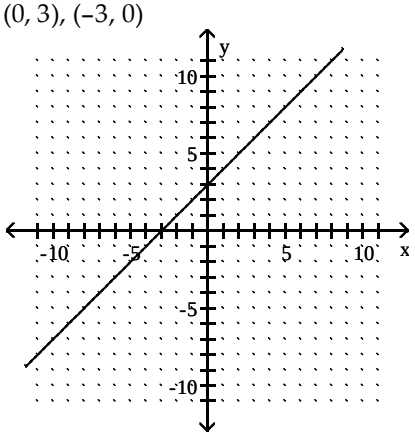
x	y
0	y = 3
$\frac{1}{3}x = 3$, $\Rightarrow x = 9$	0

so (0, 3), (9, 0)

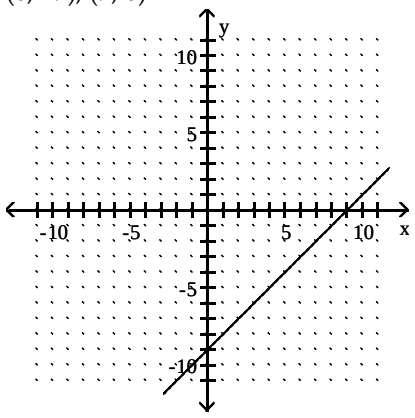
A) (0, 3), (9, 0)



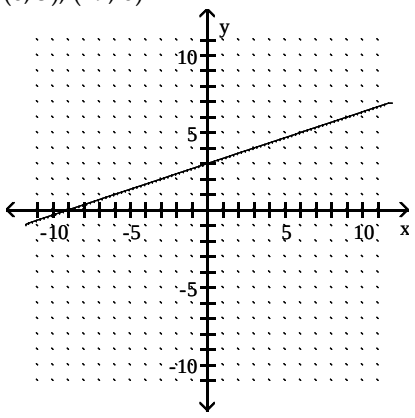
B) (0, 3), (–3, 0)



C) (0, –9), (9, 0)



D) (0, 3), (–9, 0)



Factor the polynomial.

8) $2x^3 + 6x^2 - x - 3$

A) prime polynomial B) $2x^2(x + 3)(x - 3)$ C) $(2x^2 + 3)(x - 1)$ D) $(2x^2 - 1)(x + 3)$

$2x^3+6x^2 \quad -x-3$

$2x^2(x+3) \quad -1(x+3)$

$(x+3)(2x^2-1)$

Perform the indicated operations. If possible, simplify your answer.

9) $\frac{x}{x^2 - 25} + \frac{5}{x + 5} - \frac{6}{x}$

A) $\frac{-25(x - 6)}{x(x + 5)(x - 5)}$ B) $\frac{25(x + 6)}{x(x + 5)(x - 5)}$ C) $\frac{25(x - 6)}{(x + 5)(x - 5)}$ D) $\frac{6x^2 - 25x + 150}{x(x + 5)(x - 5)}$

$\frac{x}{x(x+5)(x-5)} + \frac{5}{(x+5)} \cdot \frac{x}{x} \cdot \frac{(x-5)}{(x-5)} - \frac{6}{x} \cdot \frac{(x+5)(x-5)}{(x+5)(x-5)} = \frac{x^2 + 5x(x-5) - 6(x+5)(x-5)}{x(x+5)(x-5)}$ (x^2-25)

$\Rightarrow \frac{x^2 + 5x^2 - 25x - 6x^2 + 150}{x(x+5)(x-5)} \Rightarrow \frac{-25x + 150}{x(x+5)(x-5)} \Rightarrow \boxed{\frac{-25(x-6)}{x(x+5)(x-5)}}$

Solve the system of equations.

10) $\begin{aligned} 5x - 2y &= -1 \\ 7x + 4y &= 53 \end{aligned}$

A) (3, 8) B) (2, 9) C) (3, 9) D) (2, 8)

$2(5x - 2y = -1) \Rightarrow 10x - 4y = -2$

$+ \quad 7x + 4y = 53$

$17x = 51$

$x = 3$

PI

$5x - 2y = -1$

$5(3) - 2y = -1$

$15 - 2y = -1$

$-2y = -16$

$y = 8$

$(3, 8)$

Factor the polynomial.

11) $27c^3 + 512$

A) $(3c + 8)(9c^2 + 64)$

B) $(3c + 8)(9c^2 - 24c + 64)$

C) $(27c + 8)(c^2 - 24c + 64)$

D) $(3c - 8)(9c^2 + 24c + 64)$

$27c^3 + 512 = (3c + 8)(9c^2 - 24c + 64)$

SOAP

CUBE ROOTS

LL LR RR

Solve the equation for the specified variable.

12) The simple interest formula: $P = \frac{A}{1 + rt}$ for t

A) $t = \frac{A - P}{Pr}$ B) $t = \frac{P - 1}{Ar}$ C) $t = P - rA$ D) $t = \frac{P - A}{1 + r}$

$(1+rt)P = \frac{A}{1+rt}(1+rt)$

$P + Prt = A$

$-P \quad -P$

$\frac{Prt}{Pr} = \frac{A-P}{Pr} \Rightarrow t = \frac{A-P}{Pr}$

Use the properties of exponents to simplify the expression. Write with positive exponents.

13) $\dfrac{(-3x^{1/7})^4}{x^{-1/3}}$

A) $81x^{19/21}$ B) $-3x^{5/21}$ C) $-3x^{19/21}$ D) $81x^{5/21}$

$$\frac{(-3x^{1/7})^4}{x^{-1/3}} \Rightarrow \frac{(-3)^4 x^{\frac{4}{7}} x^{\frac{1}{3}}}{x^{-1/3}} \Rightarrow 81 x^{\frac{4}{7}+\frac{1}{3}} \Rightarrow \boxed{81 x^{\frac{19}{21}}}$$

Write the standard form of the equation.

14) Through (–4, 6), perpendicular to 8x + 7y = 10

A) 7x – 8y = –76 B) 8x – 7y = –76 C) 7x + 8y = –76 D) 7x – 8y = 1

$8x+7y=10$

$7y=-8x+10$

$y=\frac{-8}{7}x+\frac{10}{7}$

$m=\frac{-8}{7}$, so

Perpendicular slope is $m=\frac{7}{8}$

$y-y_1=m(x-x_1)$

$y-6=\frac{7}{8}(x+4)$

$8y-48=7x+28$

$-76=7x-8y$

$\boxed{7x-8y=-76}$

Use the quadratic formula to solve the equation.

15) $6x^2 = -16x - 5$

A) $\frac{-8 - \sqrt{94}}{6}, \frac{-8 + \sqrt{94}}{6}$

B) $\frac{-16 - \sqrt{34}}{6}, \frac{-16 + \sqrt{34}}{6}$

C) $\frac{-8 - \sqrt{34}}{6}, \frac{-8 + \sqrt{34}}{6}$

D) $\frac{-8 - \sqrt{34}}{12}, \frac{-8 + \sqrt{34}}{12}$

$6x^2 + 16x + 5 = 0$

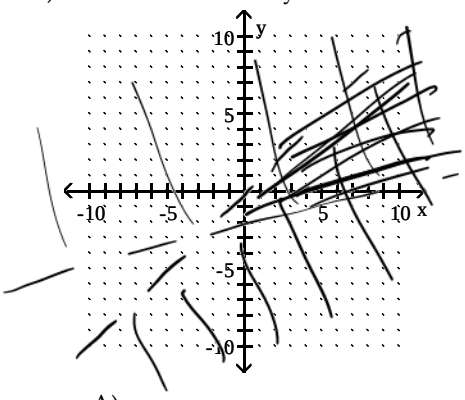
$b^2 - 4ac = 16^2 - 4(6 \cdot 5) = 136 = 4 \cdot 34$

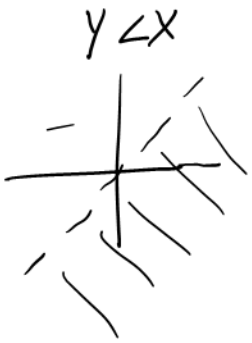
$x = \frac{-16 \pm \sqrt{4 \cdot 34}}{12} = \frac{-8 \pm 2\sqrt{34}}{12} \Rightarrow \frac{-8 + \sqrt{34}}{6}, \frac{-8 - \sqrt{34}}{6}$

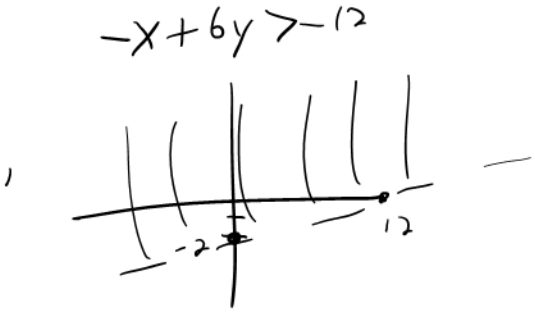
$(\div 2)$

Graph the inequality.

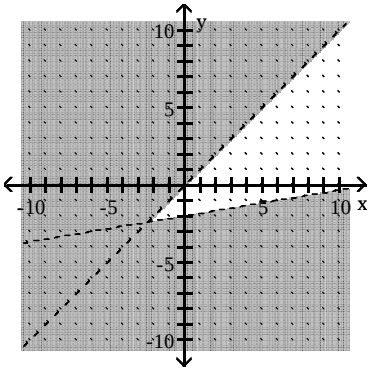
16) The intersection of $y < x$ and $-1x + 6y > -12$







A)



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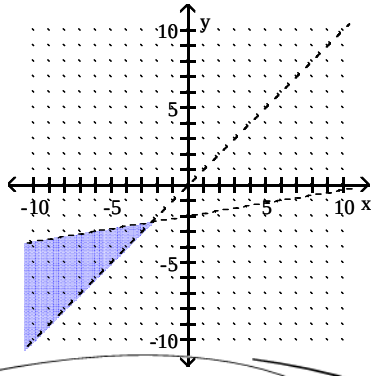
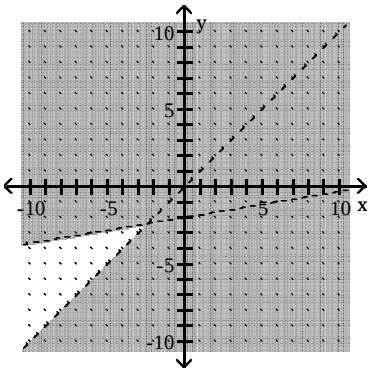
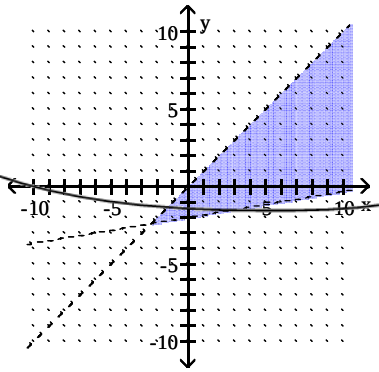


C)



D)



Solve the inequality. Graph the solution set.

17) $|h - 6| - 3 \leq 3$

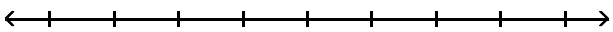
$|h-6| \leq 6 \Rightarrow$

$-6 \leq h-6 \leq 6$

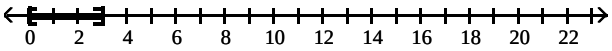
$+6 \quad +6 \quad +6$

$0 \leq h \leq 12$

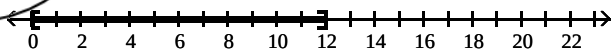
$[0, 12]$



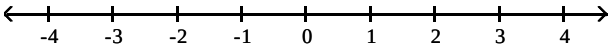
A) [0, 3]



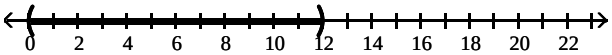
B) [0, 12]



C) { }



D) (12, 0)



Simplify the complex fraction.

18) $\dfrac{9 + \frac{3}{x}}{\frac{x}{4} + \frac{1}{12}}$ $\cdot \dfrac{12x}{12x}$

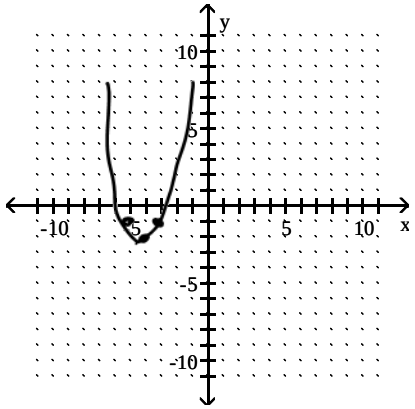
$\Rightarrow \dfrac{12x \cdot 9 + 3 \cdot 12}{3 \cdot x \cdot x + 1 \cdot x} \Rightarrow \dfrac{108x + 36}{3x^2 + x} \Rightarrow \dfrac{36(3x+1)}{x(3x+1)}$

A) $\frac{x}{36}$ B) 1 C) $\frac{36}{x}$ D) 36

$\Rightarrow \boxed{\frac{36}{x}}$

Sketch the graph of the quadratic function. Give the vertex and axis of symmetry.

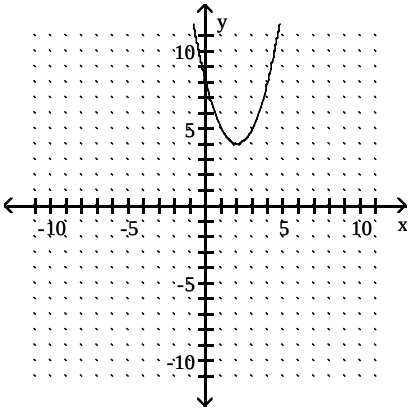
19) $f(x) = (x + 4)^2 - 2$



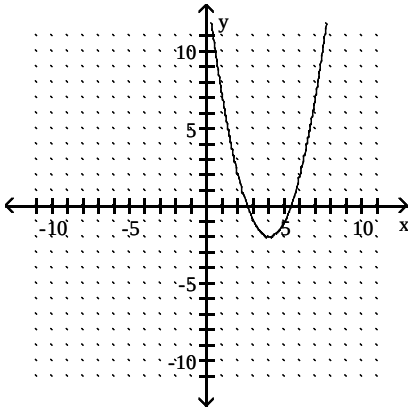
vertex $(-4, -2)$, over 1 up 1

Axis of sym $x = -4$

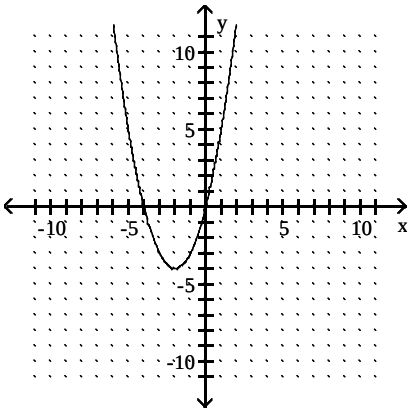
A) Vertex (2, 4), x = 2



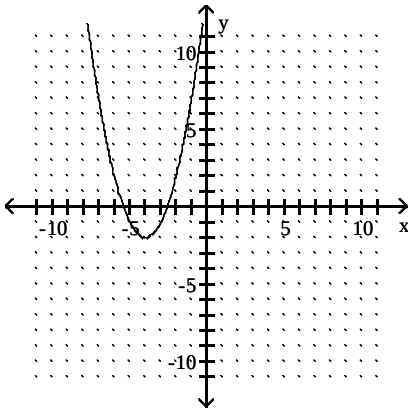
B) Vertex (4, –2), x = 4



C) Vertex (–2, –4), x = –2



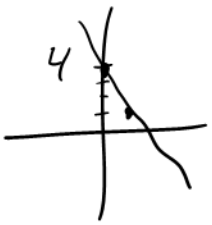
D) Vertex (–4, –2), x = –4



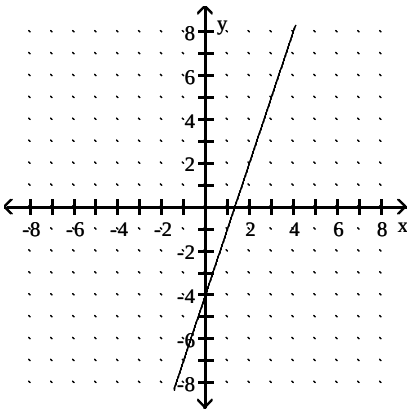
Match the equation with its graph.

20) f(x) = −3x + 4

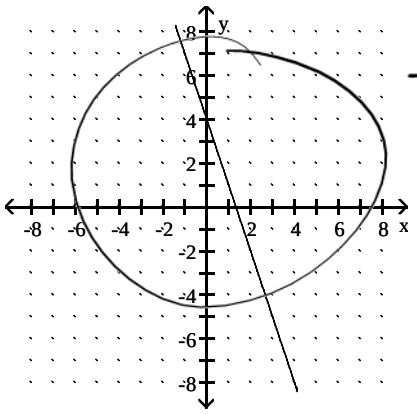
Slope −3 → down 3, Right 1. y int = 4



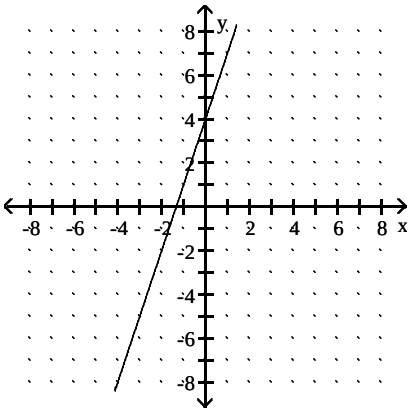
A)



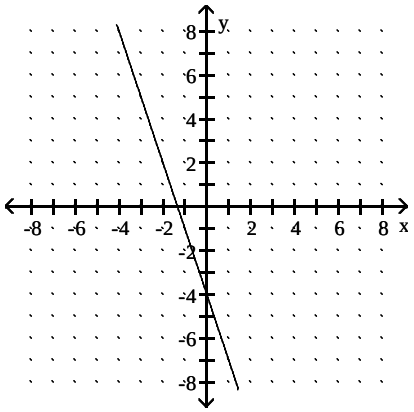
B)



C)



D)



Solve.

21) The cost in millions of dollars for a company to manufacture x thousand automobiles is given by the function $C(x) = 5x^2 - 40x + 144$. Find the number of automobiles that must be produced to minimize the cost.

A) 64 thousand automobiles B) 8 thousand automobiles

C) 20 thousand automobiles D) 4 thousand automobiles

MIN = vertex

$$x = \frac{-b}{2a} = \frac{-(-40)}{2(5)} = \frac{40}{10} = 4$$

Express as a single logarithm.

22) $5 \log_b m - \log_b n$

A) $\log_b m^5 \div \log_b n$ B) $\log_b \frac{m^5}{n}$ C) $\log_b (m^5 - n)$ D) $\log_b \frac{5m}{n}$

$$\log_b m^5 - \log_b n \Rightarrow \log_b \left(\frac{m^5}{n}\right)$$

Solve the equation.

23) $x(4x + 16) = 0$

A) {0, 4} B) $\left\{0, -\frac{1}{4}\right\}$ C) $\left\{0, \frac{1}{4}\right\}$ D) {0, –4}

$x = 0 \quad , \quad 4x + 16 = 0$

$x = 0, \quad 4x = -16 \Rightarrow x = -4$

$\{0, -4\}$

Find the domain and range.

24) {(12,–2), (–5,–5), (11,2), (11,–6)}

A) domain = {11, 12, –5, –11}; range = {2, –2, –5, –6}

B) domain = {2, –2, –5, –6}; range = {11, 12, –5}

C) domain = {11, 12, –5}; range = {2, –2, –5, –6}

D) domain = {11, 12, –5, 21}; range = {2, –2, –5, –6}

DOMAIN $\Rightarrow$ x's $\Rightarrow \{-5, 11, 12\}$

RANGE $\Rightarrow$ y's $\Rightarrow \{-6, -5, -2, 2\}$

Rationalize the denominator. Assume all variables represent positive real numbers.

25) $\dfrac{1+\sqrt{10}}{1-\sqrt{10}}$

A) 1 B) $\dfrac{-9-2\sqrt{10}}{11}$ C) $\dfrac{11+2\sqrt{10}}{-9}$ D) $\dfrac{11-2\sqrt{10}}{-9}$

$\dfrac{(1+\sqrt{10})(1+\sqrt{10})}{(1-\sqrt{10})(1+\sqrt{10})} \Rightarrow \dfrac{1+\sqrt{10}+\sqrt{10}+10}{1+\sqrt{10}-\sqrt{10}-10} \Rightarrow \boxed{\dfrac{11+2\sqrt{10}}{-9}}$

Solve.

26) $\sqrt{2x+3} = 6-x$

A) 3 B) 3, 11 C) $-1+\sqrt{67}, -1-\sqrt{67}$ D) no solution

$(\sqrt{2x+3})^2 = (6-x)^2 \Rightarrow 2x+3 = 36-12x+x^2 \Rightarrow x^2-14x+33=0$

$\Rightarrow (x-11)(x-3)=0 \Rightarrow x=3, 11$ but $x=11 \Rightarrow \sqrt{25} \neq -5$

so $\boxed{x=3}$

27) A certain store has a fax machine available for use by its customers. The store charges $1.55 to send the first page and $0.45 for each subsequent page. Use an inequality to find the maximum number of pages that can be faxed for $7.85

A) at most 14 pages B) at most 17 pages C) at most 5 pages D) at most 45 pages

cost: $0.45x + 1.55$

Ineq: $0.45x + 1.55 \leq 7.85$

$\Rightarrow 0.45x \leq 6.3$

$x \leq 14$ (AT MOST 14)

28) A rectangular sign must have an area of 40 square yards. Its length must be 4 yards more than its width. Find the dimensions of the sign to the nearest hundredth.

A) 4.48 yards, 8.48 yards B) 8.63 yards, 12.63 yards C) 18.52 yards, 4.63 yards D) 4.63 yards, 8.63 yards

$A = LW \Rightarrow 40 = (w+4)w$

$\Rightarrow 40 = w^2 + 4w \Rightarrow w^2 + 4w - 40 = 0$

$b^2 - 4ac = 16 + 160 = 176$

$w = \frac{-4 \pm \sqrt{176}}{2} = 4.63, -8.63$ (NO, NEG. distance)

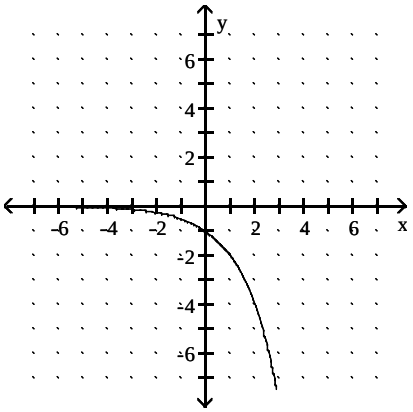
$w = 4.63$, $L = w + 4 = 4.63 + 4 = 8.63$

4.63 yd by 8.63 yd

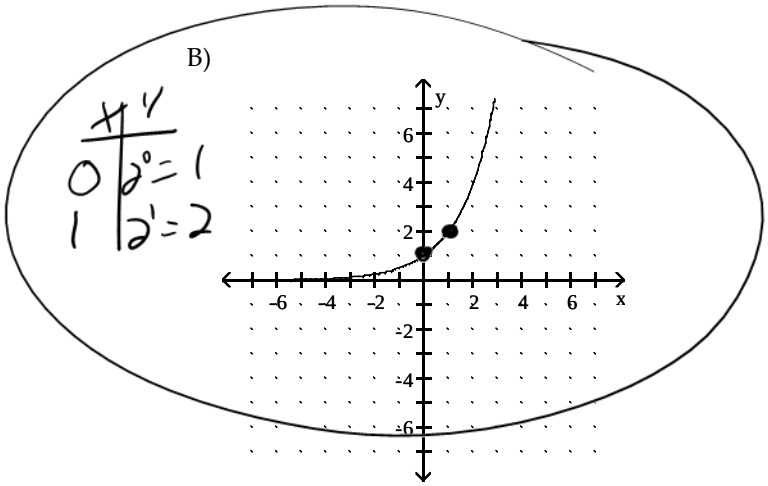
Match the exponential function to the graph.

29) $f(x) = 2^x$

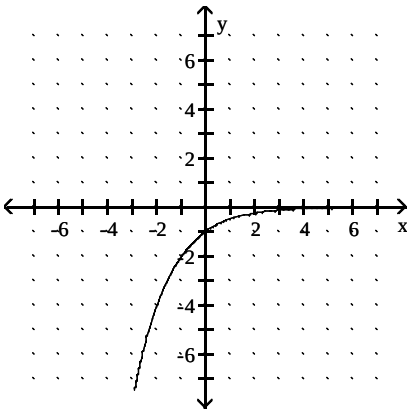
A)



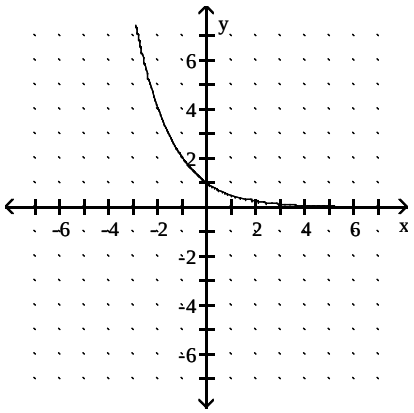
B)



C)



D)



Solve the system for the variable x.

30)
$$\begin{aligned} x - y + z &= 4 \\ x + y + z &= -4 \\ x + y - z &= -8 \end{aligned}$$

A) no solution B) x = –4 C) x = 2 D) x = –2

R1+R2: $x-y+z=4$ and $+\ x+y+z=-4$

$2x+2z=0$

R1+R3: $x-y+z=4$ and $+\ x+y-z=-8$

$2x=-4 \Rightarrow x=-2$

$2x+2z=0 \Rightarrow 2(-2)+2z=0 \Rightarrow 2z=4 \Rightarrow z=2$

$x-y+z=4 \Rightarrow -2-y+2=4 \Rightarrow -y=4 \Rightarrow y=-4$

Full solution $(-2,-4,2)$. I Get the full solution so I can check it in all three equations so I know

$\boxed{x=-2}$

Answer Key
Testname: FINAL_BF02

1) C
2) D
3) D
4) C
5) A
6) A
7) A
8) D
9) A
10) A
11) B
12) A
13) A
14) A
15) C
16) D
17) B
18) C
19) D
20) B
21) D
22) B
23) D
24) C
25) C
26) A
27) A
28) D
29) B
30) D