

HAlgebra 231

Part 1 Multiple Choice.

\_\_\_\_\_ 1.) Simplify:  $\left(\frac{6x^{-5}y^3}{5y^{-4}}\right)^2$ .

a.)  $\frac{36y^{14}}{25x^{10}}$

b.)  $\frac{6y^2}{5y^7}$

c.)  $\frac{6}{5x^7y^2}$

d.)  $\frac{36y^2}{25x^7}$

\_\_\_\_\_ 2.) Line  $l$  passes through  $(1, -3)$  and is perpendicular to  $y = \frac{1}{5}x - 7$ . What is the equation of line  $l$ ?

a.)  $y = -5x + 2$

b.)  $y = -5x - 2$

c.)  $y = -\frac{1}{5}x - \frac{14}{5}$

d.)  $y = \frac{1}{5}x - \frac{14}{5}$

\_\_\_\_\_ 3.) Evaluate  $f(-3)$  if  $f(x) = x^2 + 2x - 1$ .

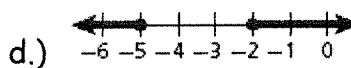
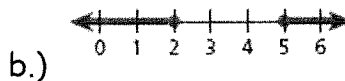
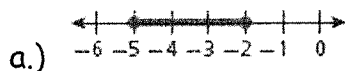
a.)  $f(-3) = -18$

b.)  $f(-3) = -1$

c.)  $f(-3) = 2$

d.)  $f(-3) = 14$

\_\_\_\_\_ 4.) Which is the graph of the solution to  $|2x - 7| \geq 3$ ?



\_\_\_\_\_ 5.) If  $P(x) = x^3 - 2x^2 - 3x + 5$  and  $P(a) = -1$ , then what is the value of  $a$ ?

a.) -2

b.) 0

c.) 2

d.) 3

\_\_\_\_\_ 6.) Solve:  $6x - 2(2 + x) = 9x + (4 - 5x)$ .

a.)  $x = 0$

b.)  $x = 8$

c.) all real numbers

d.) no solution

\_\_\_\_\_ 7.) Find the function for the graph of  $f(x) = \sqrt{x}$  after a translation of 4 units to the right and 3 units down.

- a.)  $g(x) = 3 + \sqrt{x-4}$                       b.)  $g(x) = 3 + \sqrt{x+4}$   
c.)  $g(x) = -3 + \sqrt{x-4}$                       d.)  $g(x) = -3 + \sqrt{x+4}$

\_\_\_\_\_ 8.) The cost of catering a banquet varies directly as the number of people who attend the banquet. If it costs \$3875 to cater a banquet that is attended by 250 people, how much will it cost to cater a banquet that is attended by 400 people?

- a.) \$6200                      b.) \$7000                      c.) \$7750                      d.) \$8500

\_\_\_\_\_ 9.) Which multiplier represents a 7% decay?

- a.) 0.93                      b.) -0.07                      c.) 0.07                      d.) -0.93

\_\_\_\_\_ 10.) Which describes the end behavior of the graph of  $y = -x^3 + 2x^2 - 4x + 2$ ?

- a.) rises at both ends                      b.) rises on the right, falls on the left  
c.) falls at both ends                      d.) rises on the left, falls on the right

\_\_\_\_\_ 11.) Find the solution to the equation:  $\ln(x+3) - \ln 10 = 0$ .

- a.) -3                      b.) 0                      c.) 10                      d.) 7

\_\_\_\_\_ 12.) Determine the location of the horizontal asymptotes in the graph of the function  $y = \frac{3x-2}{2x+1}$ .

- a.)  $y = 2$                       b.)  $y = 1.5$                       c.)  $y = 3$                       d.) There are none

\_\_\_\_\_ 13.) If  $\frac{x^2-6x+8}{x-2} = 5$ , what is  $x$ ?

- a.) 5                      b.) -5                      c.) 9                      d.) -9

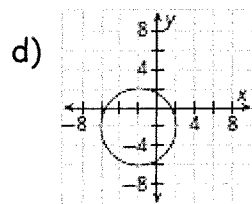
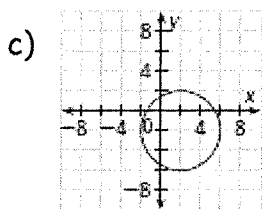
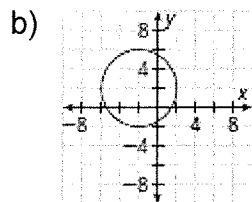
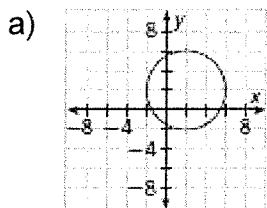
\_\_\_\_\_ 11.) Factor:  $27x^3 - 64$ .

- a.)  $(3x-4)(9x^2+12x+16)$                       b.)  $(3x+4)(9x^2-12x+16)$   
c.)  $(3x-4)(x^2+16)$                       d.)  $(27x-64)(x^2+1)$

\_\_\_\_\_ 12.) List all the roots of the equation:  $x^4 + x^2 - 2 = 0$ .

- a)  $\{\pm 1, \pm i\}$       b)  $\{\pm 1, \pm \sqrt{2}\}$       c)  $\{\pm 1, \pm i\sqrt{2}\}$       d)  $\{\pm 1, \sqrt{2} \pm i\}$

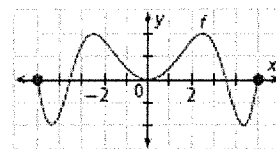
\_\_\_\_\_ 13.) Which is the graph of  $(x+2)^2 + (y-2)^2 = 16$  ?



### HALgebra 231 Part 2 Short Answer

1.) State the domain and range of the function graphed at right:

Domain: \_\_\_\_\_ Range: \_\_\_\_\_

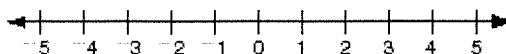


2.) Solve for  $x$ :  $\frac{2}{2x-5} = \frac{3}{x+1}$

3.) Solve for  $x$ :  $|9-3x|=21$

4.) Solve for  $x$ :  $\frac{3}{4}(-4x-12) = -3(3+x)$

5.) Solve for  $x$  and graph the solution:  $-10 \leq 3x+5 < 8$



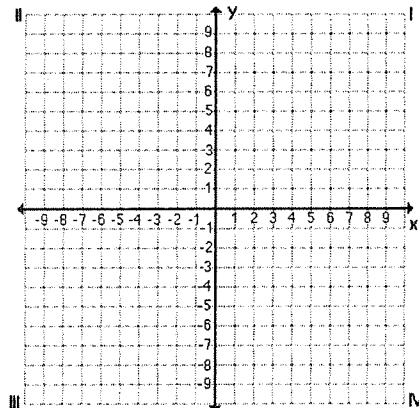
6.) Solve the equation to the nearest hundredth, if necessary  $8(x - 7)^2 = 200$ .

7.) The equation  $y = 0.5x + 14.3$  represents the projected college enrollment, where  $x$  represents the number of years since 1998, and  $y$  is the enrollment in thousands. Use the formula to predict the enrollment for 2010.

8.) Graph the system and approximate the solution to the system of equations:

$$\begin{cases} y = 2 \\ 3x - y = 6 \end{cases}$$

Solution = \_\_\_\_\_



9.) Simplify:  $\frac{2 + 5i}{6 - 8i}$

10.) . Given the quadratic function  $y = 3x^2 - 9x + 12$  find:

a.) the coordinates of the vertex

- b.) the equation for the axis of symmetry
- c.) the x-intercept(s)
- d.) the y-intercept(s)

19. a.) \_\_\_\_\_  
 b.) \_\_\_\_\_  
 c.) \_\_\_\_\_  
 d.) \_\_\_\_\_

11.) Solve the system of equations algebraically : 
$$\begin{cases} y = 2x - 4 \\ 3x - y = -2 \end{cases}$$

12.) The formula  $s = \sqrt{\frac{A}{4.828}}$  can be used to approximate the side length,  $s$ , of a regular octagon with area  $A$ . A stop sign is shaped like a regular octagon with a side length of 12.4 inches. To the nearest square inch, what is the area of the stop sign?



13.) Janine has job offers at two companies. One company offers a starting salary of \$28,000 with a raise of \$3000 every year. The other company offers a starting salary of \$36,000 with a raise of \$2,000 every year.

a) After how many years would the salary be the same for both companies?

b) What would the salary be?



Simplify:

$$14.) \frac{3x+6}{x-5} \cdot \frac{x^2-3x-10}{x^2-4}$$

$$15.) \frac{4x^6}{x^2y} \div \frac{6x}{y^4}$$

$$16.) \frac{3x}{x-3} - \frac{x}{x-3}$$

$$17.) \frac{\frac{1}{x}+1}{\frac{1}{x}-x}$$

18.) Solve the equation  $\log_4(x-6) + \log_4 x = 2$ , for  $x$ .

19.) What are the solutions to the equation  $x^3 + 3x^2 = 10x$ ?

20.) What is the remainder when  $4x^3 - 2x^2 - 10x + 1$  is divided by  $(x-3)$ ?

21.) Write a polynomial equation with linear and quadratic factors having all integral coefficients and zeros at  $1+i, \sqrt{2}, -3$

Solve for  $x$  (round answer to the nearest hundredth where necessary):

$$22.) \log_x 216 = 3$$

$$23.) 10^x = 4720$$

$$24.) e^{3x} = e^{x-4}$$

25.)  $2\log_3 x = \log_3(2x+3)$

26.)  $(x+2)^{\frac{1}{3}} = 3$

27.)  $\sqrt{5x+2} = 2\sqrt{x}$

28.)  $\frac{3}{x} + \frac{3x+1}{x^2} = \frac{13}{x^2}$

29.) What is the quotient of  $\frac{4-x^2}{x^2-x-2} \div (x^2+3x+2)$ ?

30.) If  $f(x) = 3x - 4$ , find  $f^{-1}(x)$ .

31.) If the population of a city was 2 million in 1995 and growing at a rate 6.4%, what will the population be in 2000?

32.) The rate at which a liquid vitamin breaks down in the average human body can be modeled by  $y = D(0.95)^x$ , where  $y$  ml of the original dose  $D$ , remains after  $x$  minutes. How long will it take the original dose of 15 ml to be reduced to less than 5 ml?

33.) Given  $f(x) = \frac{1}{x+2}$  and  $g(x) = 3x + 5$  find  $f(g(x))$ .



Part 1 **Multiple Choice.**

A 1.) Simplify:  $\left(\frac{6x^{-5}y^3}{5y^{-4}}\right)^2$ .

a.)  $\frac{36y^{14}}{25x^{10}}$

b.)  $\frac{6y^2}{5y^7}$

c.)  $\frac{6}{5x^7y^2}$

d.)  $\frac{36y^2}{25x^7}$

A 2.) Line  $l$  passes through  $(1, -3)$  and is perpendicular to  $y = \frac{1}{5}x - 7$ . What is the equation of line  $l$ ?

a.)  $y = -5x + 2$

b.)  $y = -5x - 2$

c.)  $y = -\frac{1}{5}x - \frac{14}{5}$

d.)  $y = \frac{1}{5}x - \frac{14}{5}$

C 3.) Evaluate  $f(-3)$  if  $f(x) = x^2 + 2x - 1$ .

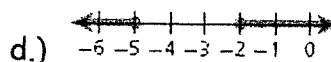
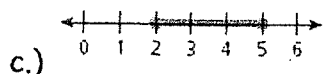
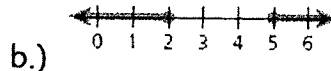
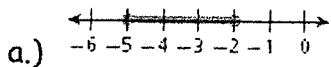
a.)  $f(-3) = -18$

b.)  $f(-3) = -1$

c.)  $f(-3) = 2$

d.)  $f(-3) = 14$

B 4.) Which is the graph of the solution to  $|2x - 7| \geq 3$ ?



C 5.) If  $P(x) = x^3 - 2x^2 - 3x + 5$  and  $P(a) = -1$ , then what is the value of  $a$ ?

a.) -2

b.) 0

c.) 2

d.) 3

D 6.) Solve:  $6x - 2(2 + x) = 9x + (4 - 5x)$ .

a.)  $x = 0$

b.)  $x = 8$

c.) all real numbers

d.) no solution

C

7.) Find the function for the graph of  $f(x) = \sqrt{x}$  after a translation of 4 units to the right and 3 units down.

a.)  $g(x) = 3 + \sqrt{x-4}$

b.)  $g(x) = 3 + \sqrt{x+4}$

c.)  $g(x) = -3 + \sqrt{x-4}$

d.)  $g(x) = -3 + \sqrt{x+4}$

A

8.) The cost of catering a banquet varies directly as the number of people who attend the banquet. If it costs \$3875 to cater a banquet that is attended by 250 people, how much will it cost to cater a banquet that is attended by 400 people?

a.) \$6200

b.) \$7000

c.) \$7750

d.) \$8500

A

9.) Which multiplier represents a 7% decay?

a.) 0.93

b.) -0.07

c.) 0.07

d.) -0.93

D

10.) Which describes the end behavior of the graph of

$$y = -x^3 + 2x^2 - 4x + 2?$$

a.) rises at both ends

b.) rises on the right, falls on the left

c.) falls at both ends

d.) rises on the left, falls on the right

D

11.) Find the solution to the equation:  $\ln(x+3) - \ln 10 = 0$ .

a.) -3

b.) 0

c.) 10

d.) 7

B

12.) Determine the location of the horizontal asymptotes in the graph of

the function  $y = \frac{3x-2}{2x+1}$ .

a.)  $y = 2$

b.)  $y = 1.5$

c.)  $y = 3$

d.) There are none

C

13.) If  $\frac{x^2-6x+8}{x-2} = 5$ , what is  $x$ ?

a.) 5

b.) -5

c.) 9

d.) -9

A

11.) Factor:  $27x^3 - 64$ .

a.)  $(3x-4)(9x^2+12x+16)$

b.)  $(3x+4)(9x^2-12x+16)$

c.)  $(3x-4)(x^2+16)$

d.)  $(27x-64)(x^2+1)$

C

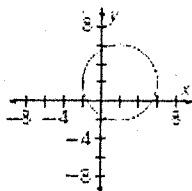
12.) List all the roots of the equation:  $x^4 + x^2 - 2 = 0$ .

- a)  $\{\pm 1, \pm i\}$       b)  $\{\pm 1, \pm \sqrt{2}\}$       c)  $\{\pm 1, \pm i\sqrt{2}\}$       d)  $\{\pm 1, \sqrt{2} \pm i\}$

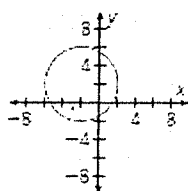
B

13.) Which is the graph of  $(x+2)^2 + (y-2)^2 = 16$  ?

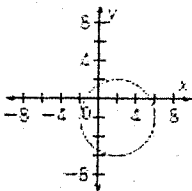
a)



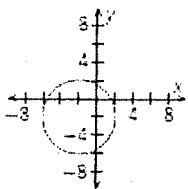
b)



c)



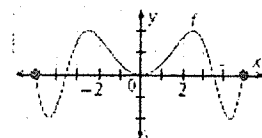
d)



### HAgebra 231 Part 2 Short Answer

1.) State the domain and range of the function graphed at right:

Domain:  $[-5, 5]$       Range:  $[-2, 2]$



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

$$4x = 17$$

$$x = 17/4$$

3.) Solve for  $x$ :  $|9-3x|=21$

$$9-3x=21 \quad 9-3x=-21$$

$$-3x=12 \quad -3x=-30$$

$$x=-4, \quad 10$$

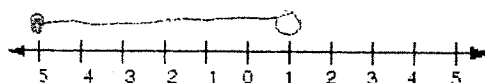
4.) Solve for  $x$ :  $\frac{3}{4}(-4x-12) = -3(3+x)$

all real  $\neq 5$   
identity

5.) Solve for  $x$  and graph the solution:  $-10 \leq 3x+5 < 8$

$$-15 \leq 3x < 3$$

$$-5 \leq x < 1$$



6.) Solve the equation to the nearest hundredth, if necessary  $8(x-7)^2 = 200$ .

$$(x-7)^2 = 25$$

$$x-7 = \pm 5$$

$$12, 2$$

7.) The equation  $y=0.5x+14.3$  represents the projected college enrollment, where  $x$  represents the number of years since 1998, and  $y$  is the enrollment in thousands. Use the formula to predict the enrollment for 2010.

$$.5(12) + 14.3$$

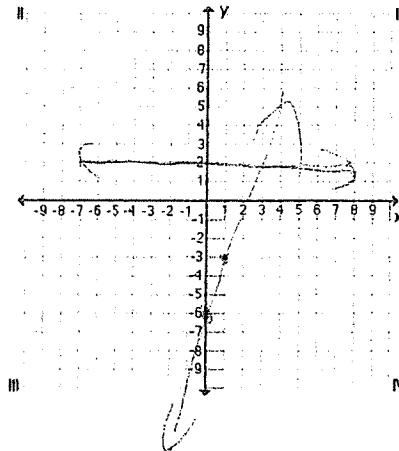
$$20.3 \text{ thousand}$$

$$20,300$$

8.) Graph the system and approximate the solution to the system of equations:

$$\begin{cases} y = 2 \\ 3x - y = 6 \end{cases}$$

Solution = (3, 2)



9.) Simplify:  $\frac{2+5i}{6-8i}$

$$\frac{-7}{25} + \frac{23}{50}i$$

10.) . Given the quadratic function ,  $y = 3x^2 - 9x + 12$  find:

a.) the coordinates of the vertex

$$\frac{9}{6} \left( \frac{3}{2}, 5\frac{1}{4} \right)$$

- b.) the equation for the axis of symmetry  
 c.) the x-intercept(s)  
 d.) the y-intercept(s)

a.  $(\frac{3}{2}, 5\frac{1}{4})$

19. a)  $X = 1\frac{1}{2}$   
 b) none  
 c) 12  
 d)

- 11.) Solve the system of equations algebraically :  $\begin{cases} y = 2x - 4 \\ 3x - y = -2 \end{cases}$

$3x - 2x - 4 = -2$   
 $x = -6$

$(-6, -16)$

- 12.) The formula  $s = \sqrt{\frac{A}{4.828}}$  can be used to approximate the side length,  $s$ , of a regular octagon with area  $A$ . A stop sign is shaped like a regular octagon with a side length of 12.4 inches. To the nearest square inch, what is the area of the stop sign?



$12.4 = \sqrt{\frac{A}{4.828}}$   
~~742.35328~~  
 742.59 in

- 13.) Janine has job offers at two companies. One company offers a starting salary of \$28,000 with a raise of \$3000 every year. The other company offers a starting salary of \$36,000 with a raise of \$2,000 every year.

- a) After how many years would the salary be the same for both companies?

$28,000 + 3,000x = 36,000 + 2,000x$   
 $x = 8 \text{ yrs}$



- b) What would the salary be?

$\$52,000$

Simplify:

14.)  $\frac{3x+6}{x-5} \cdot \frac{x^2-3x-10}{x^2-4}$

$\frac{3(x+2)}{(x-5)} \cdot \frac{(x-5)(x+2)}{(x+2)(x-2)}$   
 $\frac{3(x+2)}{x-2}$

15.)  $\frac{4x^6}{x^2y} \div \frac{6x}{y^4}$

$\frac{2x^5}{x^2y} \cdot \frac{y^4}{6x}$   
 $\frac{2x^3y^3}{3}$

16.)  $\frac{3x}{x-3} \cdot \frac{x}{x-3}$

$\frac{2x}{x-3}$

17.)  $\frac{\frac{1}{x}+1}{\frac{1}{1-x}}$

$\frac{1+x}{1-x^2} \cdot \frac{(x-1)}{(x-1)(-1-x)}$   
 $\frac{1}{1-x}$

18.) Solve the equation  $\log_4(x-6) + \log_4 x = 2$ , for x.

$16 = \frac{x-6}{x} \quad 16x = x-6 \quad 15x = -6$

$\frac{-6}{15} = \frac{2}{5}$

19.) What are the solutions to the equation  $x^3 + 3x^2 = 10x$ ?

$x^3 + 3x^2 - 10x = 0$   
 $x(x+5)(x-2) = 0$   
 $0, -5, 2$

20.) What is the remainder when  $4x^3 - 2x^2 - 10x + 1$  is divided by  $(x-3)$ ?

$\begin{array}{r} 3 \ 1 \ 4 \ -2 \ 1 \\ 4 \ 12 \ 30 \ 60 \\ \hline 3 \ 1 \ 4 \ -2 \ 1 \end{array}$   
 $r = 61$

21.) Write a polynomial equation with linear and quadratic factors

having all integral coefficients and zeros at  $1+i, \sqrt{2}, -3$

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

Solve for x (round answer to the nearest hundredth where necessary):

22.)  $\log_x 216 = 3$

$x^3 = 216$   
 $x = 6$

23.)  $10^x = 4720$

$3.67$

24.)  $e^{3x} = e^{x-4}$

$3x = x-4$   
 $2x = -4$   
 $x = -2$

25.)  $2\log_3 x = \log_3(2x+3)$

$$x^2 - 2x - 3$$

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

$$\textcircled{3} \quad \times$$

26.)  $(x+2)^{\frac{1}{3}} = 3$

$$x+2 = 27$$

$$\textcircled{x = 25}$$

27.)  $\sqrt{5x+2} = 2\sqrt{x}$

$$5x+2 = 4x$$

$$x = -2$$

no solution

28.)  $\frac{3x}{x^2} + \frac{3x+1}{x^2} = \frac{13}{x^2}$

$$3x + 3x + 1 = 13$$

$$6x = 12$$

$$\textcircled{x = 2}$$

29.) What is the quotient of  $\frac{4-x^2}{x^2-x-2} \div (x^2+3x+2)$ ?

$$\frac{(2+x)(2-x)}{(x-2)(x+1)} \div \frac{1}{(x+2)(x+1)}$$

$$\textcircled{\frac{-1}{(x+1)^2}}$$

30.) If  $f(x) = 3x - 4$ , find  $f^{-1}(x)$ .

$$f^{-1}(x) = \frac{x+4}{3}$$

31.) If the population of a city was 2 million in 1995 and growing at a rate 6.4%, what will the population be in 2000?

$$2(1.064)^5$$

$$2,727,373$$

32.) The rate at which a liquid vitamin breaks down in the average human body can be modeled by  $y = D(0.95)^x$ , where  $y$  ml of the original dose  $D$ , remains after  $x$  minutes. How long will it take the original dose of 15 ml to be reduced to less than

5 ml?

$$5 = 15(0.95)^x$$
$$\frac{1}{3} = 0.95^x$$

21.42 min

33.) Given  $f(x) = \frac{1}{x+2}$  and  $g(x) = 3x+5$  find  $f(g(x))$ .

$$\frac{1}{3x+5+2}$$

$$\frac{1}{3x+7}$$