

## College Algebra Waiver Review

1) Evaluate the expression for  $x = -2$ ,  $y = 3$ , and  $a = -4$ .

a)  $x^3 - 3y + 5a$       b)  $\frac{y+2x}{y-4a}$       c)  $\frac{\frac{6}{y} - \frac{a}{2}}{\frac{x}{2} + \frac{15}{y}}$

2) Evaluate the function.

a) Find  $g(a-1)$  when  $g(x) = \frac{1}{5}x + 3$ .

b) Find  $g(a-1)$  when  $g(x) = 4x + 3$

c) Find  $f(k-1)$  when  $f(x) = 4x^2 + 3x + 4$ .

3) Perform the indicated operations.

a)  $(-9 + 7x^5 + 5x^7 + 4x^6) + (-9x^6 - 5x^5 - 3 + 2x^7)$

b)  $2(-2r^4 + 9r^3 - 3r) - 3(8r^4 - 9r^3 + 6r^2 - 2r)$

c)  $(4n^6 - 3n + 6n^3) + (-2n^3 + 8n^6 - 4n)$

4) Solve for  $y$ .

a)  $2x = 3y - 10$       b)  $2 = 5x - 7y$       c)  $y - 7(x + 8) = 7 + 2y$

d)  $4x - 10(x + y) = y - x$

5) Perform the indicated operations. Write the answer using only positive exponents. Assume all variables represent positive real numbers.

a)  $(-27)^{\frac{2}{3}}$       b)  $(8k^3m^{-6})^{\frac{1}{3}}$       c)  $\left(\frac{b^{-5/6}}{n^{-7/4}}\right)^2 \left(\frac{n^{1/3}}{b^{1/7}}\right)^{-3}$

6) Perform the indicated operations.

a)  $\frac{x}{x^2 - 16} - \frac{8}{x^2 + 5x + 4}$       b)  $\frac{2ab}{a^2 - b^2} - \frac{b}{a - b} + \frac{8}{2}$       c)  $\frac{2ab}{a^2 - b^2} - \frac{b}{a - b} + 2$

7) Find the center-radius form of the equation of the circle.

a) center  $(-6, -4)$ , radius 3      b) center  $(-8, -6)$ , radius  $\sqrt{17}$

c) center  $(-5, 3)$ , passing through the point  $(1, 11)$

d) diameter with endpoints  $(-5, 1)$  and  $(3, 7)$

8) Evaluate the logarithms.

a)  $\log_7 \frac{1}{7}$       b)  $\log_8 \frac{1}{64}$       c)  $\log_3 \sqrt{3}$       d)  $\log_8 64$

9) Determine whether or not each of the given tables represents  $y$  as a function of  $x$ .

a)

x	-1	0	1	2	3
y	5	7	-1	5	-8

b)

x	5	7	-1	5	-8
y	-1	0	1	2	3

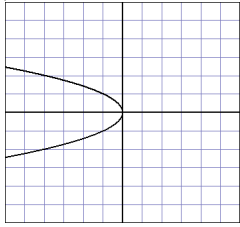
10) Tell whether or not each set of ordered pairs defines  $y$  as a function of  $x$ . Then state the domain and range of each.

a)  $\{(5,1), (3,2), (4,9), (7,6)\}$

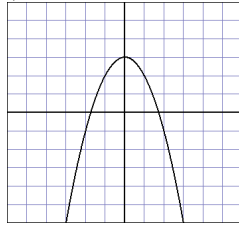
b)  $\{(2,4), (0,2), (2,5)\}$

11) Determine whether or not each relation defines  $y$  as a function of  $x$ .

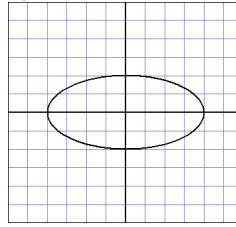
a)



b)



c)



d)  $y = 2x - 3$

e)  $y = -3x^2 + 5$

f)  $x = -3y^2 + 4$

g)  $x^2 + y^2 = 25$

12) Write an equation in slope-intercept form for each line described. Then give the slope and y-intercept and graph.

a) through  $(2, 4)$ ,  $m = -1$

b) through  $(8, -1)$  and  $(4, 3)$

c) vertical, through  $(-6, 4)$

d)  $x$  intercept  $-2$ ,  $y$  intercept  $4$

e) through  $(1, 2)$ ; parallel to  $y - 2x = 3$

f) through  $(2, -1)$ ; perpendicular to  $y = -\frac{5}{3}x - 2$

g) through  $(1, 3)$  with slope  $-2$

h) through  $(-1, 3)$  and  $(3, 4)$

i) horizontal through  $(-2, 7)$

13) The graph of each equation below is a parabola. State the vertex of each parabola.

a)  $f(x) = \frac{1}{3}(x-5)^2 + 2$

b)  $f(x) = -2(x+8)^2 - 7$

c)  $y = 2x^2 - 12x + 7$

d)  $y = x^2 - 8x + 1$

14) Determine whether each of the following functions is even, odd, or neither.

a)  $f(x) = -x^3 + 4x$

b)  $f(x) = x^3 - x + 3$

c)  $f(x) = 4x^2 + 1$

**15) Solve each of the following quadratic equations. You may use the zero-factor property, square root property, completing the square, and/or the quadratic formula.**

a)  $x^2 + 2x = 8$                       b)  $-4x^2 + x + 3 = 0$                       c)  $(x-4)^2 = -20$                       d)  $x^2 + 7x = -12$

e)  $3x^2 + 2x - 5 = 0$                       f)  $4x^2 - 10 = 3x$                       g)  $x^2 = 2x - 10$                       h)  $3x^2 + x = 10$

**16) Given**  $f(x) = \begin{cases} 1-x & \text{for } x < -3 \\ 3 & \text{for } -3 \leq x < 2 \\ -2x+2 & \text{for } x \geq 2 \end{cases}$  **find each of the following:**

(a)  $f(-4)$                       (b)  $f(-2)$                       (c)  $f(0) + f(-5)$                       (d)  $f(4) - f(-1)$

**17) Graph each of the following functions and state the transformations that have been applied to the basic function  $f(x) = x^2$ .**

a)  $f(x) = x^2 + 2$                       b)  $f(x) = (x-3)^2 - 5$                       c)  $f(x) = -x^2 - 4$

**18) Determine whether the graph of each equation is symmetric with respect to the  $x$ -axis, the  $y$ -axis, the origin, or none of these.**

a)  $y = 3x^4 - 1$                       b)  $y = x^3 - x$                       c)  $y = x + 12$

**19) Write an equation for each of the following and graph.**

- a) The graph of  $y = x^3$  is shifted 2 units down and shifted 4 units right.  
 b) The graph of  $y = \sqrt{x}$  is reflected across the  $x$ -axis and shifted up 3 units.

**20) Given  $f(x) = 3x + 4$  and  $g(x) = 2x - 5$ , find each of the following, in simplified form.**

a)  $(f + g)(2)$                       b)  $(f - g)(1)$                       c)  $(fg)(-3)$                       d)  $\left(\frac{f}{g}\right)(2)$

**21) Given  $f(x) = x^2 + 3$  and  $g(x) = 4x - 5$ , find each of the following.**

a)  $(f + g)(x)$                       b)  $(f - g)(x)$                       c)  $(fg)(x)$                       d)  $\left(\frac{f}{g}\right)(x)$

e)  $(f \circ g)(x)$                       f)  $(g \circ f)(x)$                       g)  $(f \circ g)(-1)$                       h)  $(g \circ f)(2)$

**22) Write each exponential equation in its equivalent logarithmic form and vice-versa.**

a)  $2^5 = 32$                       b)  $25^x = 5$                       c)  $\log_6 36 = 2$                       d)  $\log_x 30 = 5$

23) Solve each equation below and give the exact values as well as decimal approximations, to 4 decimal places.

a)  $\log_5 x = -3$       b)  $\log(5x) = 2$       c)  $\log(x + 750) = 3$       d)  $12 - 3\ln x = 6$

e)  $\ln(x - 2) = 3$       f)  $3\log_6(x) - 5 = 4$       g)  $10 + 4\ln x = 46$

h)  $2500 = e^{5x}$       i)  $2e^{4x+4} = 8$       j)  $6(2^{5x}) = 894$       k)  $1000 = 700(10^x)$

24) Write each expression as a single logarithm with coefficient 1. Simplify your answers as much as possible. (Assume that all variables represent positive numbers.)

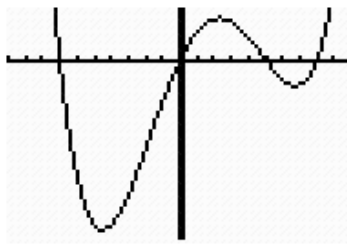
a)  $2\ln(3a) + \ln b$       b)  $2\log_4 x^3 - \frac{1}{3}\log_4 p^3$       c)  $5\log_a x - 7\log_a y^6$

25) Estimate the  $x$ -intercepts. ( $x$ -axis scale is 1 unit per tick mark.)

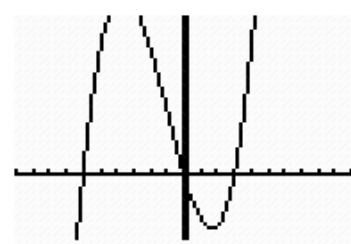
a)



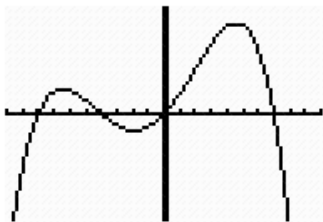
b)



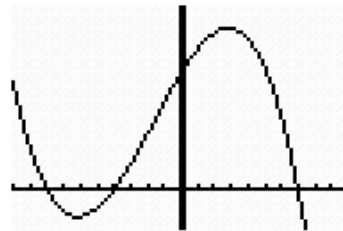
c)



d)



e)



26) Given that the zeros of a polynomial  $P(x)$  are  $-3, -1, 3$  &  $9$ , give a possible equation for  $P(x)$ .

College Algebra Waiver Review Answers

1) a)  $-37$    b)  $-\frac{1}{19}$    c)  $1$    2) a)  $\frac{a+14}{5}$    b)  $4a-1$    c)  $4k^2-5k+5$

3) a)  $7x^7-5x^6+2x^5-12$    b)  $-28r^4+45r^3-18r^2$    c)  $12n^6+4n^3-7n$

4) a)  $y = \frac{2x+10}{3}$    b)  $y = \frac{5x-2}{7}$    c)  $y = -7x-63$    d)  $y = -\frac{5}{11}x$

5) a)  $9$    b)  $\frac{2k}{m^2}$    c)  $\frac{n^{5/2}}{b^{26/21}}$

6) a)  $\frac{x^2-7x+32}{(x-4)(x+4)(x+1)}$    b)  $\frac{4a+5b}{a+b}$    c)  $\frac{2a+3b}{a+b}$

7) a)  $(x+6)^2+(y+4)^2=9$    b)  $(x+8)^2+(y+6)^2=17$

c)  $(x+5)^2+(y-3)^2=100$    d)  $(x+1)^2+(y-4)^2=25$

8) a)  $-1$    b)  $-2$    c)  $\frac{1}{2}$    d)  $2$    9) a) Yes, a function   b) No, not a function

10) a) Yes, it is a function; Domain  $\{5,3,4,7\}$ ; Range  $\{1,2,9,6\}$

b) Not a function; Domain  $\{2,0\}$ ; Range  $\{4,2,5\}$

11) a) Not a Function   b) Function   c) Not a Function

d) Function   e) Function   f) Not a Function   g) Not a Function

12) a)  $y = -x + 6$ ;  $m = -1$ ; y-intercept:  $(0,6)$    b)  $y = -x + 7$ ;  $m = -1$ ; y-int:  $(0,7)$

c)  $x = -6$ , slope is undefined; no y-intercept   d)  $y = 2x + 4$ ;  $m = 2$ ; y-int:  $(0,4)$

e)  $y = 2x$ ;  $m = 2$ ; y-int:  $(0,0)$    f)  $y = \frac{3}{5}x - \frac{11}{5}$ ;  $m = \frac{3}{5}$ ; y-int:  $(0, -\frac{11}{5})$

g)  $y = -2x + 5$ ;  $m = -2$ ; y-int:  $(0, 5)$    h)  $y = \frac{1}{4}x + \frac{13}{4}$ ;  $m = \frac{1}{4}$ ; y-int:  $(0, \frac{13}{4})$

i)  $y = 7$   $m = 0$ ; y-int:  $(0, 7)$

13) a)  $(5, 2)$    b)  $(-8, -7)$    c)  $(3, -11)$    d)  $(4, -15)$

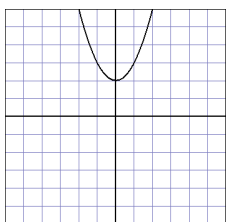
14) a) Odd, (origin symmetry)   b) Neither, (no symmetry)   c) Even, (y-axis symmetry)

15) a)  $\{-4, 2\}$    b)  $\left\{-\frac{3}{4}, 1\right\}$    c)  $\{4 \pm 2i\sqrt{5}\}$    d)  $\{-4, -3\}$    e)  $\left\{-\frac{5}{3}, 1\right\}$

f)  $\left\{\frac{-5}{4}, 2\right\}$    g)  $\{1 \pm 3i\}$    h)  $\left\{-2, \frac{5}{3}\right\}$

- 16) a) 5            b) 3            c) 9    d) -9

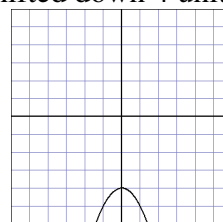
17) a) shifted 2 units up



b) shifted 3 units right and 5 units down

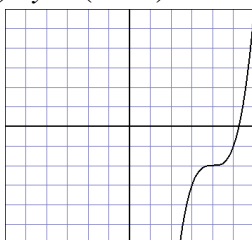


c) Reflected across x-axis and shifted down 4 units

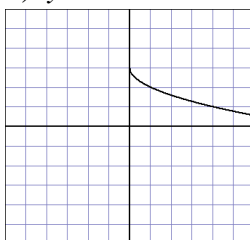


- 18) a) y-axis            b) origin            c) none

19) a)  $y = (x-4)^3 - 2$



b)  $y = -\sqrt{x} + 3$



- 20) a) 9            b) 10            c) 55            d) -10

- 21) a)  $x^2 + 4x - 2$             b)  $x^2 - 4x + 8$             c)  $4x^3 - 5x^2 + 12x - 15$             d)  $\frac{x^2 + 3}{4x - 5}$   
 e)  $16x^2 - 40x + 28$             f)  $4x^2 + 7$             g) 84            h) 23

- 22) a)  $\log_2 32 = 5$     b)  $\log_{25} 5 = x$             c)  $6^2 = 36$             d)  $x^5 = 30$

- 23) a)  $5^{-3} = x$ ;  $x = \frac{1}{125}$             b)  $10^2 = 5x$ ;  $x = 20$             c)  $10^3 = x + 750$ ;  $x = 250$

- d)  $x = e^2 \approx 7.3891$             e)  $x = 2 + e^3 \approx 22.0855$             f)  $6^3 = x$ ;  $x = 216$

- g)  $x = e^9 \approx 8103.0839$             h)  $x = \frac{\ln 2500}{5} \approx 1.5648$             i)  $x = \frac{-4 + \ln 4}{4} \approx -0.6534$

- j)  $x = \frac{\ln 149}{5 \ln 2} \approx 1.4438$             k)  $x = \log\left(\frac{10}{7}\right) \approx 0.1549$

- 24) a)  $\ln(9a^2b)$             b)  $\log_4\left(\frac{x^6}{p}\right)$             c)  $\log_a\left(\frac{x^5}{y^{42}}\right)$

- 25) a) -5, -1 and 2    b) -7, 0, 5 and 8    c) -6, 0 and 3    d) -8, -4, 0 and 7    e) -8, -4 and 7

26)  $P(x) = (x+3)(x+1)(x-3)(x-9)$