

Name key

Per. _____ Date _____

Score _____

EXPRESSIONS: Simplify, factor, evaluate, expand, condense or perform the indicated operation.

1) $3(\log x + \log y) - 4\log(x-2)$

$$3\log xy - 4\log(x-2)$$

$$\log(xy)^3 - \log(x-2)^4$$

$$\log \frac{x^3 y^3}{(x-2)^4}$$

2) $3x^4 - 2x^2 - 8$

$$(x^2 - 2)(3x^2 + 4)^{\frac{-6}{3} \times \frac{4}{-2}}$$

3) $\log_{100}(\log 10)$

$$\log_{100} 1 =$$

$$0$$

4) $28x^5 - 63x^3$

$$7x^3(4x^2 - 9)$$

$$7x^3(2x+3)(2x-3)$$

5) $\ln \frac{x^4 y}{e}$

$$\ln x^4 y - \ln e$$

$$\ln x^4 + \ln y - \ln e$$

$$4\ln x + \ln y - 1$$

7) $\log_5 \frac{1}{125}$

$$5^{-3} = \frac{1}{125}$$

$$-3$$

6) $\frac{1}{2}(x+2)^2 - 5$

$$\frac{1}{2}(x+2)(x+2) - 5$$

$$\frac{1}{2}(x^2 + 4x + 4) - 5$$

$$\frac{1}{2}x^2 + 2x + 2 - 5$$

$$\frac{1}{2}x^2 + 2x - 3$$

8) $8x^3 - 27$

$$(2x-1)(4x^2+2x+1)$$

9) $(2x-3)^4$

$$4(2x)^4(-3)^0 = 1(16x^4)(1)$$

$$4C_1(2x)^3(-3)^1 = 4(8x^3)(-3)$$

$$4C_2(2x)^2(-3)^2 = 6(4x^2)(9)$$

$$4C_3(2x)^1(-3)^3 = 4(2x)(-27)$$

$$4C_4(2x)^0(-3)^4 = 1(1)(81)$$

10) $(3x+1)(x^2-2x-1)$

$$3x^3 - 6x^2 - 3x + x^2 - 2x - 1$$

$$3x^3 - 5x^2 - 5x - 1$$

$$16x^4 - 96x^3 + 216x^2 - 216x + 81$$

EQUATIONS: Solve the following equations. Round answers to the nearest tenth when necessary.

11) $2 = \log_3(x-3) + \log_3(x+5)$

$$2 = \log_3(x-3)(x+5)$$

$$2 = \log_3(x^2 + 5x - 3x - 15)$$

$$3^2 = 3 \log_3(x^2 + 2x - 15)$$

$$9 = x^2 + 2x - 15$$

$$0 = x^2 + 2x - 24$$

$$0 = (x+6)(x-4) \quad \boxed{x=4} -6$$

12) $x^3 + 5x^2 + 4x + 4 = x^2 + 3$

$$x^3 + 4x^2 + 4x + 1 = 0$$

$$\begin{array}{r} -1 \mid 1 \ 4 \ 4 \ 1 \\ -1 \ -3 \ -1 \\ \hline 1 \ 3 \ 1 \ 0 \end{array}$$

$$x^2 + 3x + 1 = 0$$

$$-3 \pm \sqrt{9-4}$$

$$\frac{-3 \pm \sqrt{5}}{2}, -1 \quad \text{or} \quad \boxed{-0.4, -2.6, -1}$$

13) $3^{3+4x} + 5 = 17$

$$3^{3+4x} = 12$$

$$\log_3 3^{3+4x} = \log_3 12$$

$$3+4x = \frac{\log 12}{\log 3}$$

$$\boxed{x = -0.2}$$

14) $17 = 4x^2 - 2x + 14$

$$0 = 4x^2 - 2x - 3$$

$$\frac{2 \pm \sqrt{4 + 4(4)(3)}}{8}$$

$$\frac{2 \pm \sqrt{52}}{8}$$

$$\frac{2 \pm 2\sqrt{13}}{8}$$

$$\frac{1 \pm \sqrt{13}}{4} \quad \text{or} \quad \boxed{-0.7, 1.2}$$

15) $3 \ln(x+1) = 12$

$$\ln(x+1) = 4$$

$$e^{\ln(x+1)} = e^4$$

$$x+1 = e^4$$

$$x = e^4 - 1$$

$$\boxed{x \approx 53.6}$$

16) $3(x-4)^2 = 15$

$$(x-4)^2 = 5$$

$$x-4 = \pm \sqrt{5}$$

$$\boxed{x = 4 \pm \sqrt{5}} \quad \text{or} \quad \boxed{6.2, 1.8}$$

17) $7 + 10e^{x-4} = 15$

$$10e^{x-4} = 8$$

$$e^{x-4} = 0.8$$

$$\ln e^{x-4} = \ln 0.8$$

$$x-4 = \ln 0.8$$

$$\boxed{x \approx 3.8}$$

18) $7x^3 = 2x^2 + 5x$

$$7x^3 - 2x^2 - 5x = 0$$

$$x(7x^2 - 2x - 5) = 0$$

$$x(x-1)(7x+5) = 0$$

$$x=0 \quad x-1=0 \quad 7x+5=0$$

$$\boxed{x=0, 1, -5/7}$$

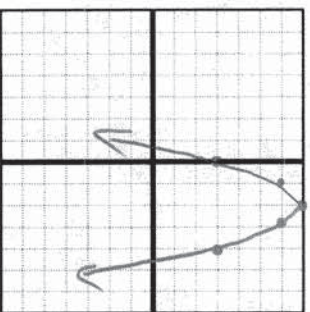
GRAPHING: Graph the following functions.

19) $f(x) = -x^2 + 4x + 3$

$x = \frac{-4}{-2} = 2$

$(2, 7)$

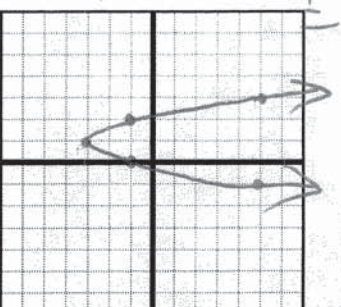
$y\text{-int.} \therefore (0, 3)$



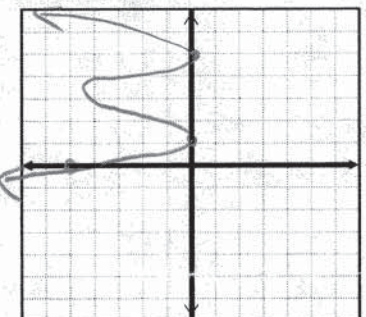
20) $f(x) = 2(x+1)^2 - 3$

$V: (-1, -3)$

$y\text{-int.} \therefore (0, -1)$



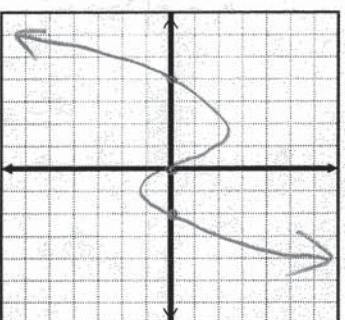
21) $g(x) = -\frac{1}{5}(x+1)^2(x+5)^2$



22) $g(x) = -x^3 - 2x^2 + 8x$

$0 = -x(x^2 + 2x - 8)$

$0 = -x(x+4)(x-2)$

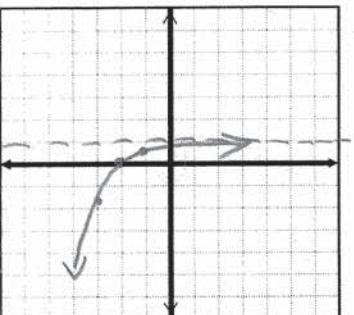


23) $f(x) = -\ln(x+1) - 2$

$y = \ln x$

$x = e^y$

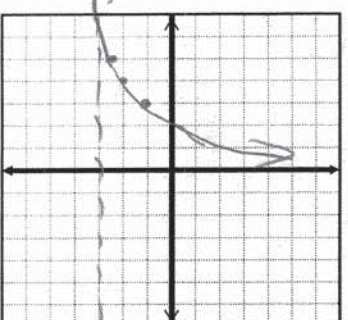
$$\begin{array}{r|l} x & y \\ 0.4 & -1 \\ 1 & 0 \\ 2.7 & 1 \end{array} \quad \begin{array}{r|l} x-1 & -y-2 \\ 0.4 & -1 \\ 0 & -2 \\ 1.7 & -3 \end{array}$$



24) $g(x) = 2^{(x+4)} - 3$

$y = 2^x$

$$\begin{array}{r|l} x & y \\ -1 & 1/2 \\ 0 & 1 \\ 1 & 2 \end{array} \quad \begin{array}{r|l} x-4 & y-3 \\ -5 & -2.5 \\ -4 & -2 \\ -3 & -1 \end{array}$$



WRITING: Write a function with the given characteristics.

- 25) A parabola with pts. (2, -3), (0, -1) and (1, -9).

$$y = ax^2 + bx + c$$

$$(2, -3) \rightarrow -3 = 4a + 2b + c$$

$$(0, -1) \rightarrow -1 = c$$

$$(1, -9) \rightarrow -9 = a + b + c$$

$$15 = 2a - 2b - 2c$$

$$-9 = 7a + b - 1$$

$$-15 = b$$

$$15 = 2a + 1$$

$$14 = 2a$$

$$a = 7$$

$$f(x) = 7x^2 - 15x - 1$$

- 27) A polynomial with zeros ± 2 and $-3i$

$$f(x) = (x^2 - 4)(x^2 + 9)$$

$$x = \pm 2 \quad x = \pm 3i$$

$$x^2 = (2)^2 \quad x^2 = (3i)^2$$

$$x^2 = 4 \quad x^2 = -9$$

$$x^2 - 4 = 0 \quad x^2 + 9 = 0$$

$$f(x) = x^4 + 5x^2 - 36$$

- 26) A parabola with x-intercepts -5 and 2, and y-intercept at -10.

$$(-5, 0) \quad (2, 0) \quad (0, -10)$$

$$y = ax^2 + bx + c$$

$$(-5, 0) \rightarrow 0 = 25a - 5b + c \rightarrow 0 = 50a - 10b + 2c$$

$$(2, 0) \rightarrow 0 = 4a + 2b + c \rightarrow 0 = 20a + 10b + 5c$$

$$(0, -10) \rightarrow -10 = c$$

$$0 = 4a + 2b - 10$$

$$6 = 2b$$

$$b = 3$$

$$0 = 70a - 70$$

$$70 = 70a$$

$$a = 1$$

$$f(x) = x^2 + 3x - 10$$

- 28) A polynomial with zeros -1 and $1 \pm 2i$.

$$x = -1$$

$$(x+1) = 0$$

$$x = 1 \pm 2i$$

$$(x-1)^2 = (\pm 2i)^2$$

$$x^2 - 2x + 1 = 4i^2$$

$$x^2 - 2x + 1 = -4$$

$$f(x) = x^3 - x^2 + 3x + 5$$

$$(x^2 - 2x + 5) = 0$$

Louis wants to fence in a rectangular field for his pet chinchilla using 400 yards of fencing he has stored in his shed. On one side is a brick wall that will not be fenced in.

- 29) Write a quadratic function describing the area.

$$2x + y = 400$$

$$y = -2x + 400$$



$$A(x) = -2x^2 + 400x$$

$$\frac{-400}{-4} = 100$$

$$x = 100$$

$$y = -2(100) + 400$$

$$y = 200$$

$$100 \text{ yd.} \times 200 \text{ yd.}$$

- 30) Find the dimensions of the enclosure.