

Exam #4 Review Questions

Note Title

5/14/2016

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$$20) \quad 3p^2 + 36 = 0$$

-36 -36

$$\frac{3p^2}{3} = \frac{-36}{3}$$

$$p^2 = -12$$

$$p = \pm \sqrt{-12}$$

$$p = \pm \sqrt{-4 \cdot 3}$$

$$\boxed{p = \pm 2i\sqrt{3}}$$

$$20) \quad (y - 4)^2 + 18 = 0$$

-18 -18

$$(y - 4)^2 = -18$$

$$y - 4 = \pm \sqrt{-18}$$

$$y - 4 = \pm \sqrt{-9 \cdot 2}$$

$$y - 4 = \pm 3i\sqrt{2}$$

+4 +4

$$\boxed{y = 4 \pm 3i\sqrt{2}}$$

$$42) \quad x^2 - 6x + 3 = 0$$

$$\quad \quad \quad \underline{-3} \quad \quad \quad \underline{-3}$$

$$x^2 - 6x + 9 = -3 + 9$$

$$(x-3)^2 = 6$$

$$x-3 = \pm \sqrt{6}$$

$$\underline{+3} \quad \underline{+3}$$

$$\boxed{x = 3 \pm \sqrt{6}}$$

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$$14) \quad \left(\frac{1}{6}x^2 + x + \frac{1}{3} = 0 \right) \cdot 6$$

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(1)(2)}}{2(1)}$$

$$x = \frac{-6 \pm \sqrt{36 - 8}}{2} = \frac{-6 \pm \sqrt{28}}{2}$$

$$x = \frac{-6 \pm \sqrt{4 \cdot 7}}{2} = \frac{-6 \pm 2\sqrt{7}}{2}$$

$$x = \frac{\cancel{2}(-3 \pm \sqrt{7})}{\cancel{2}} = \boxed{-3 \pm \sqrt{7}}$$

$$26) \quad x(x+6) = 2$$

$$x^2 + 6x = 2$$

-2 -2

$$x^2 + 6x - 2 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(1)(-2)}}{2(1)}$$

$$x = \frac{-6 \pm \sqrt{36 + 8}}{2} = \frac{-6 \pm \sqrt{44}}{2}$$

$$x = \frac{-6 \pm \sqrt{4 \cdot 11}}{2} = \frac{-6 \pm 2\sqrt{11}}{2}$$

$$x = \frac{\cancel{2}(-3 \pm \sqrt{11})}{\cancel{2}} = \boxed{-3 \pm \sqrt{11}}$$

$$32) \quad 3y^2 + 6y + 5 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-6 \pm \sqrt{(6)^2 - 4(3)(5)}}{2(3)}$$

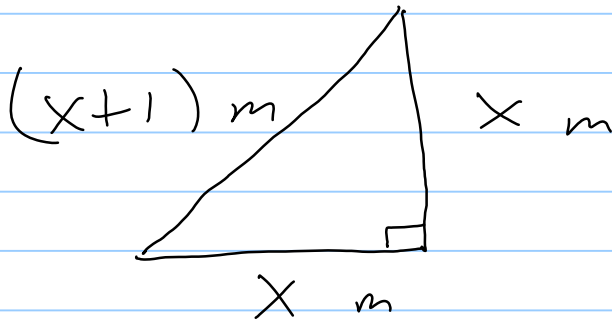
$$x = \frac{-6 \pm \sqrt{36 - 60}}{6}$$

$$x = \frac{-6 \pm \sqrt{-24}}{6} = \frac{-6 \pm \sqrt{-4 \cdot 6}}{6}$$

$$x = \frac{-6 \pm 2i\sqrt{6}}{6} = \frac{2(-3 \pm i\sqrt{6})}{\cancel{6}3}$$

$$x = \frac{-3 \pm i\sqrt{6}}{3}$$

54)



$$a^2 + b^2 = c^2$$

$$x^2 + x^2 = (x+1)^2$$

$$2x^2 = x^2 + 2x + 1$$

$$\underline{-x^2 - 2x - 1} \quad \underline{-x^2 - 2x - 1}$$

$$x^2 - 2x - 1 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-1)}}{2(1)}$$

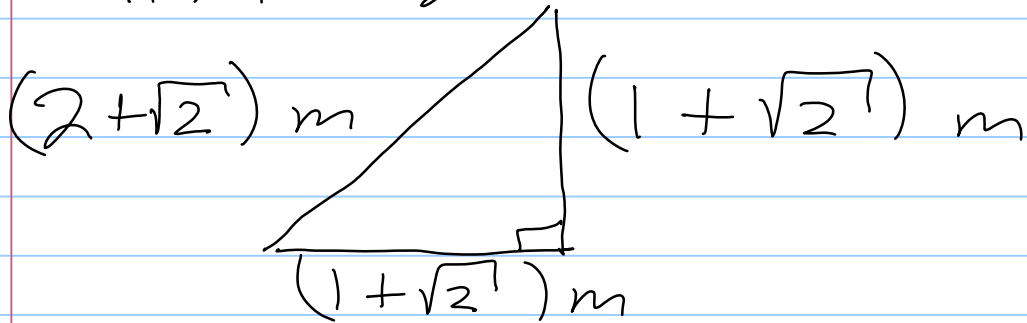
$$x = \frac{2 \pm \sqrt{4+4}}{2} = \frac{2 \pm \sqrt{8}}{2}$$

$$x = \frac{2 \pm \sqrt{4 \cdot 2}}{2} = \frac{2 \pm 2\sqrt{2}}{2}$$

$$x = \frac{\cancel{2}(1 \pm \sqrt{2})}{\cancel{2}} = 1 \pm \sqrt{2}$$

$$\Rightarrow x = 1 + \sqrt{2}$$

$$x + 1 = 2 + \sqrt{2}$$



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$$22) (m-6)^2 + 5(m-6) + 4 = 0$$

$$[(m-6) + 4][(m-6) + 1] = 0$$

$$(m-2)(m-5) = 0$$

$$m-2=0 \quad \vee \quad m-5=0$$

$$\underline{+2} \quad \underline{+2}$$

$$\underline{+5} \quad \underline{+5}$$

$$\boxed{m = 2}$$

$$\boxed{m = 5}$$

$$38) x^{2/3} - 2x^{1/3} - 8 = 0$$

$$(x^{1/3} - 4)(x^{1/3} + 2) = 0$$

$$x^{1/3} - 4 = 0 \quad \vee \quad x^{1/3} + 2 = 0$$

$$\underline{+4} \quad \underline{+4}$$

$$\underline{-2} \quad \underline{-2}$$

$$(x^{1/3})^3 = (4)^3$$

$$(x^{1/3})^3 = (-2)^3$$

$$\boxed{x = 64}$$

$$\boxed{x = -8}$$

$$44) y^{-2} - 8y^{-1} + 7 = 0$$

$$(y^{-1} - 7)(y^{-1} - 1) = 0$$

$$y^{-1} - 7 = 0 \quad \vee \quad y^{-1} - 1 = 0$$

$$(y^{-1})^{-1} = (7)^{-1}$$

$$y = \frac{1}{7}$$

$$(y^{-1})^{-1} = (1)^{-1}$$

$$y = 1$$

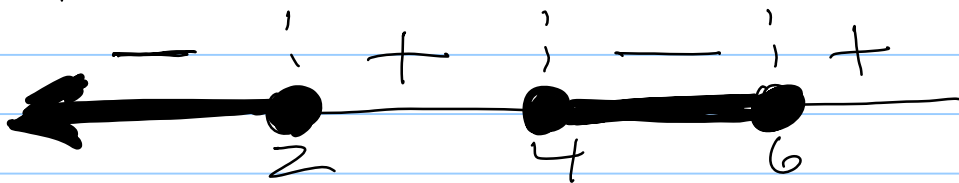
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$$10) (x-6)(x-4)(x-2) \leq 0$$

Determine Critical Numbers

$$x-6=0 \quad \vee \quad x-4=0 \quad \vee \quad x-2=0$$

$$x = 6 \qquad x = 4 \qquad x = 2$$



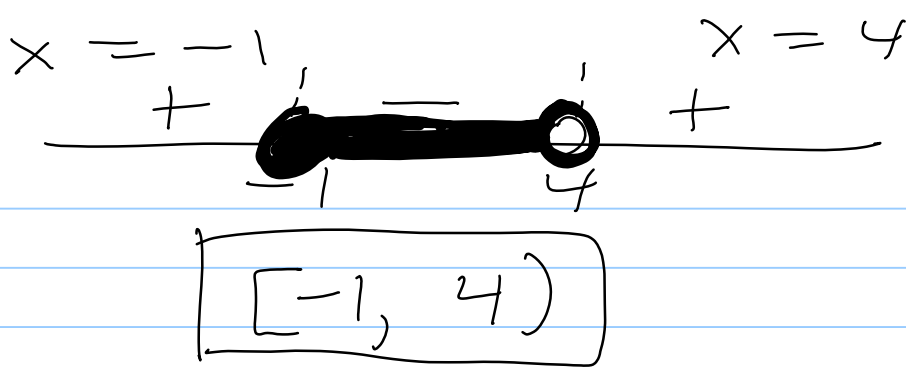
$$[-\infty, 2] \cup [4, 6]$$

$$20) \frac{x+1}{x-4} \leq 0$$

Determine Critical Numbers

$$x+1=0 \quad \vee \quad x-4=0$$

$$x = -1 \qquad x = 4$$



24) $\frac{y^2 + 15}{8y} \leq 1$

-1 -1

$$\frac{y^2 + 15}{8y} - \frac{1 \cdot 8y}{1 \cdot 8y} \leq 0$$

$$\frac{y^2 + 15}{8y} - \frac{8y}{8y} \leq 0$$

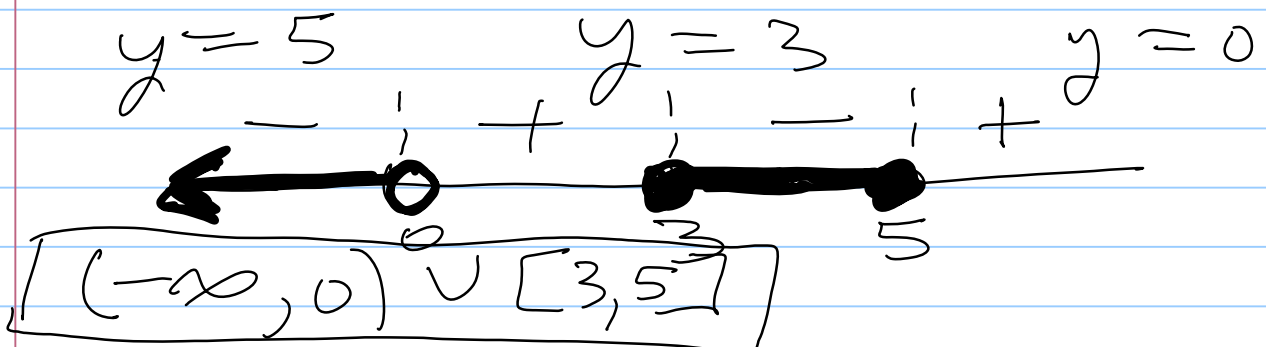
$$\frac{y^2 - 8y + 15}{8y} \leq 0$$

$$\frac{(y-5)(y-3)}{8y} \leq 0$$

Determine Critical Numbers

$$y - 5 = 0 \quad \vee \quad y - 3 = 0 \quad \vee \quad \frac{8y}{8} = 0$$

+5 +5
+3 +3
8 8

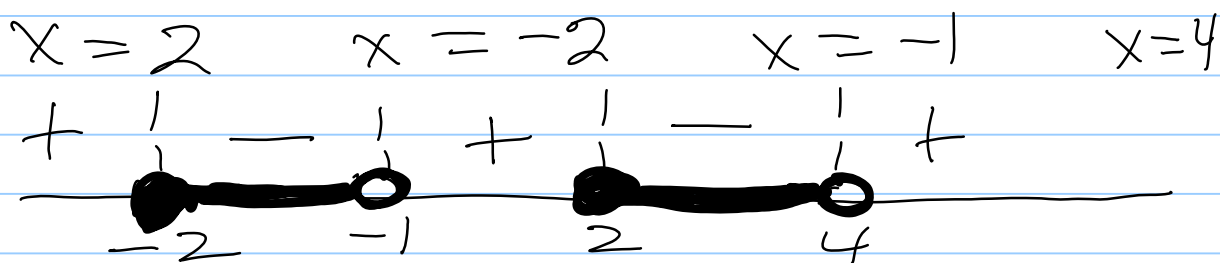


$$46) \frac{(x-2)(x+2)}{(x+1)(x-4)} \leq 0$$

Determine Critical Numbers

$$x-2=0 \vee x+2=0 \vee x+1=0 \vee x-4=0$$

+2 +2
-2 -2
-1 -1
+4 +4



$$\boxed{[-2, -1) \cup [2, 4)}$$

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$$26) g(x) = 4(x-4)^2 + 2$$

Axis of symmetry

$$\boxed{x=4}$$

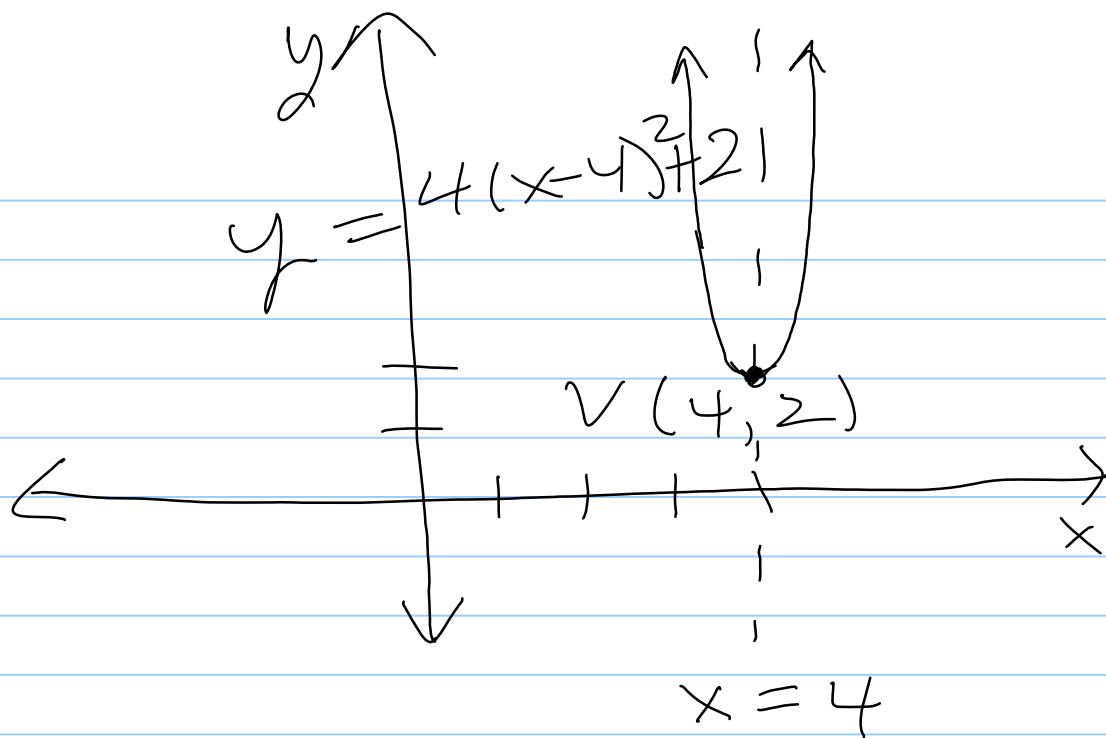
Vertex $\boxed{(4, 2)}$

$$g(4) = 4(4-4)^2 + 2 = 2$$

$$a = 4 > 0 \quad \text{up}$$

$$|a| = 4 > 1 \quad \text{thinner as}$$

compared to $y = x^2$



28) $f(x) = -(x-2)^2 - 6$

Axis of symmetry

$x = 2$

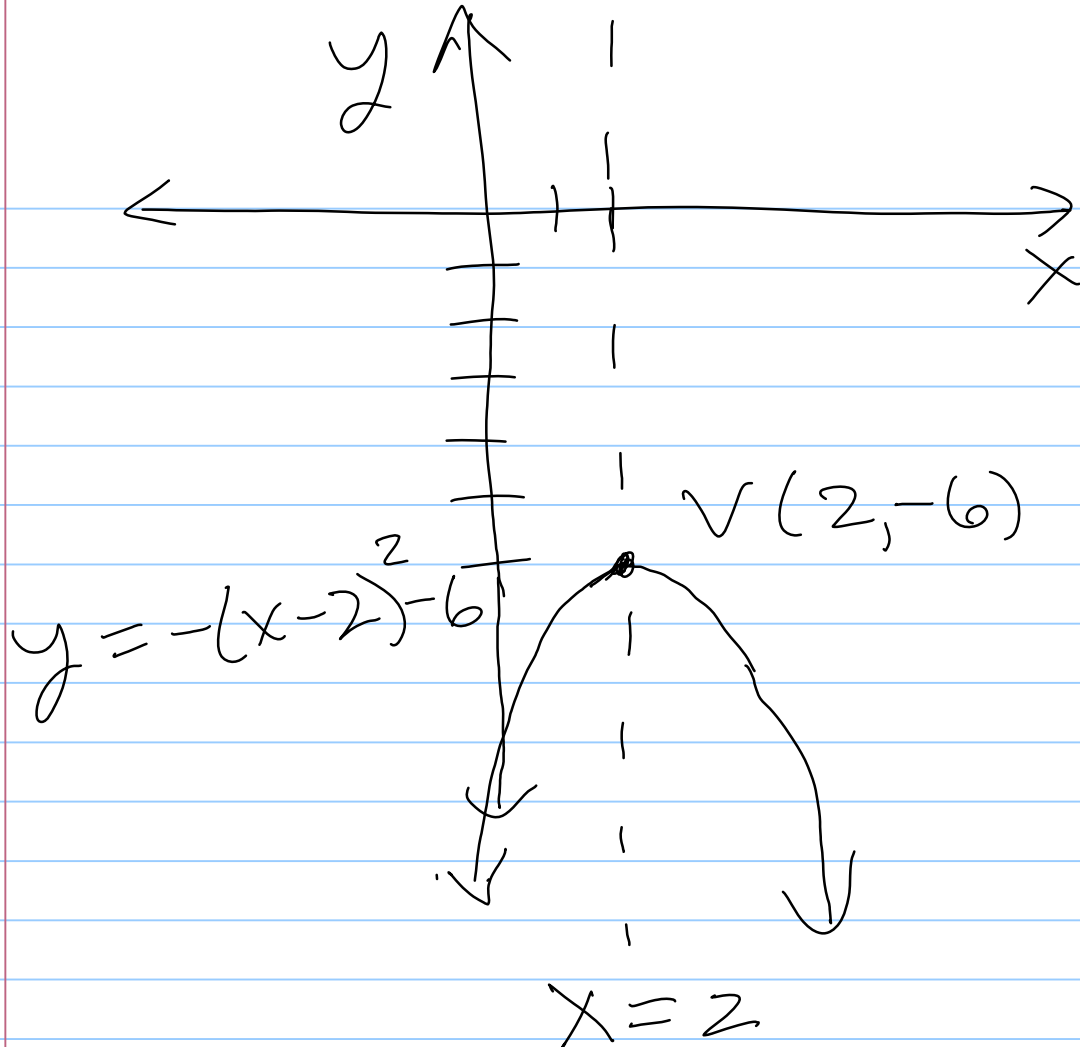
Vertex $(2, -6)$

$f(2) = -(2-2)^2 - 6 = -6$

$a = -1 < 0$ down

$|a| = 1$ same shape

as $y = x^2$



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

Axis of symmetry

$$x = -\frac{b}{2a}$$

$$x = -\frac{2}{2(1)} = -1$$

$$\boxed{x = -1}$$

Vertex $\boxed{(-1, -4)}$

$$f(-1) = (-1)^2 + 2(-1) - 3$$
$$= 1 - 2 - 3 = -4$$

$$a = 1 > 0 \quad \text{up}$$

$$|a| = 1 \quad \text{same shape } y = x^2$$

x-intercepts

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

$$(x + 3)(x - 1) = 0$$

$$x + 3 = 0 \quad \vee \quad x - 1 = 0$$

$$\underline{-3} \quad \underline{-3} \quad \underline{+1} \quad \underline{+1}$$

$$x = -3$$

$$x = 1$$

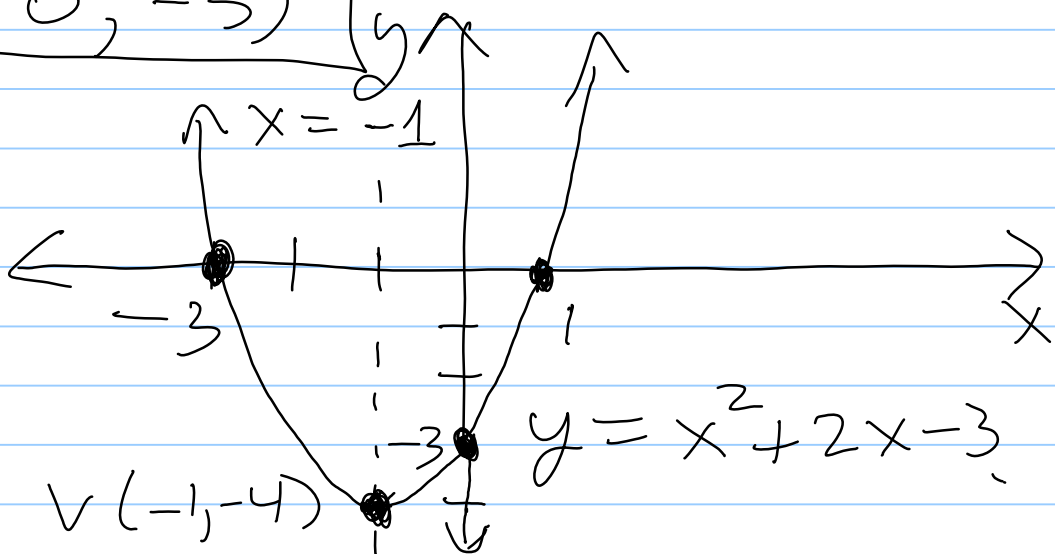
$$\boxed{(-3, 0)}$$

$$\boxed{(1, 0)}$$

y-intercept

$$f(0) = (0)^2 + 2(0) - 3 = -3$$

$$\boxed{(0, -3)}$$



$$26) f(x) = -x^2 + 4x + 4$$

Axis of symmetry

$$x = -\frac{b}{2a} = -\frac{4}{2(+1)} = 2$$

$$\boxed{x = 2}$$

Vertex $\boxed{(2, 8)}$

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

$$= -4 + 8 + 4 = 8$$

$$a = -1 < 0 \quad \text{down}$$

$|a| = 1$ same shape $y = x^2$

x-intercepts

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

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(-4)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{16 + 16}}{2} = \frac{4 \pm \sqrt{32}}{2}$$

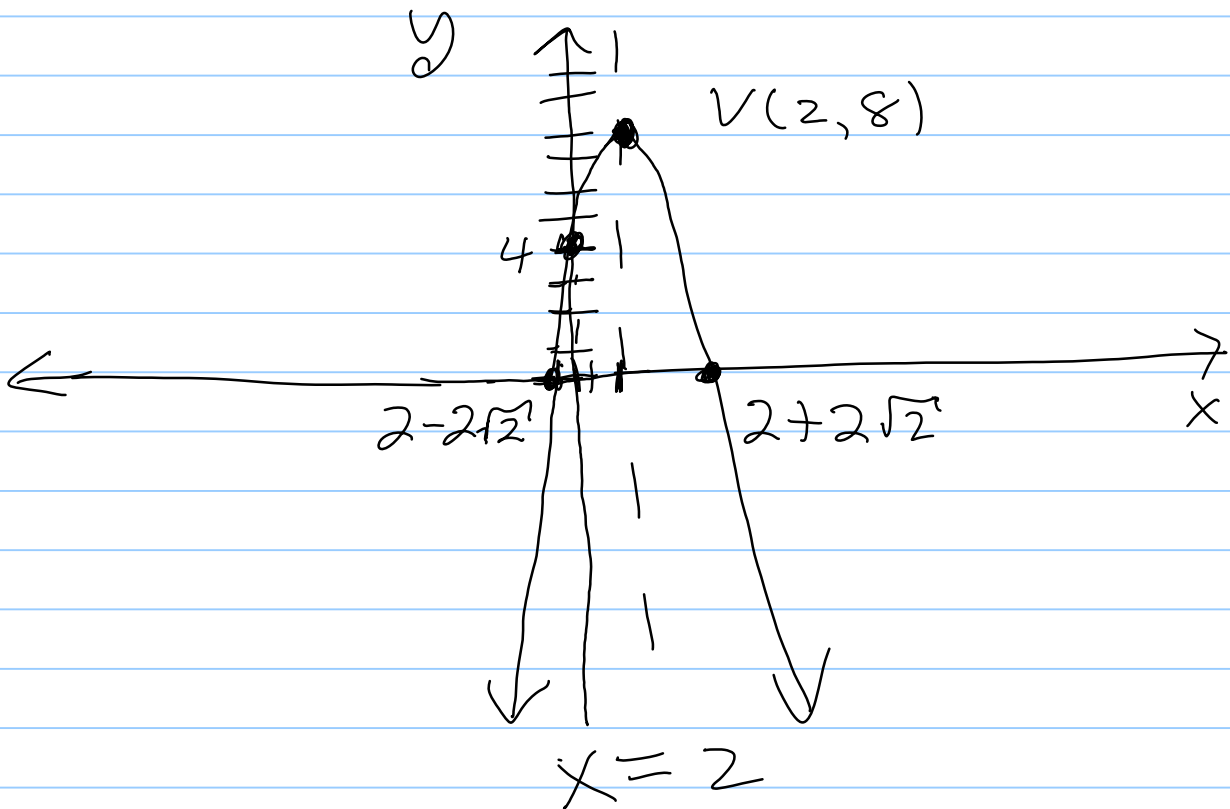
$$x = \frac{4 \pm \sqrt{16 \cdot 2}}{2} = \frac{4 \pm 4\sqrt{2}}{2}$$

$$x = \frac{2(2 \pm 2\sqrt{2})}{2} = 2 \pm 2\sqrt{2}$$

$$\boxed{(2 - 2\sqrt{2}, 0)}, \boxed{(2 + 2\sqrt{2}, 0)}$$

y-intercept $\boxed{(0, 4)}$

$$f(0) = -(0)^2 + 4(0) + 4 = 4$$



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$$f(x) = x^2 - 6x + 2$$

$$g(x) = -2x$$

$$h(x) = \sqrt{x}$$

10) $(h \circ f)(-2) = h(f(-2))$

$$f(-2) = (-2)^2 - 6(-2) + 2 \\ = 4 + 12 + 2 = 18$$

$$(h \circ f)(-2) = h(f(-2)) = h(18) \\ = \sqrt{18} = \sqrt{9 \cdot 2} = \boxed{3\sqrt{2}}$$

$$12) (f \circ h)(1) = f(h(1)) = f(\sqrt{1}) \\ = f(1) = (1)^2 - 6(1) + 2 = 1 - 6 + 2 \\ = \boxed{-3}$$

$$16) f(x) = x - 3 \\ g(x) = x^2$$

$$(f \circ g)(x) = \boxed{x^2 - 3}$$

$$(g \circ f)(x) = \boxed{(x - 3)^2}$$

$$20) f(x) = -4x \\ g(x) = x^3 + x^2 - 6$$

$$(f \circ g)(x) = -4(x^3 + x^2 - 6) \\ = \boxed{-4x^3 - 4x^2 + 24}$$

$$(g \circ f)(x) = \boxed{(-4x)^3 + (-4x)^2 - 6} \\ = \boxed{-64x^3 + 16x^2 - 6}$$

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$$34) f(x) = \frac{x-3}{2}$$

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

$$2\left(x = \frac{y-3}{2}\right)$$

$$\begin{array}{r} 2x = y - 3 \\ \underline{+3} \qquad \underline{+3} \end{array}$$

$$y = 2x + 3$$

$$\boxed{f^{-1}(x) = 2x + 3}$$

$$38) f(x) = \frac{7}{2x+4}$$

$$y = \frac{7}{2x+4}$$

$$\left(x = \frac{7}{2y+4}\right) (2y+4)$$

$$\begin{array}{r} 2xy + 4x = 7 \\ \underline{-4x} \qquad \underline{-4x} \end{array}$$

$$\frac{2xy}{2x} = \frac{7-4x}{2x}$$

$$y = \frac{7-4x}{2x}$$

$$f^{-1}(x) = \frac{7-4x}{2x}$$

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$$28) \quad \frac{1}{27} = 3^{2x}$$
$$3^{-3} = 3^{2x}$$

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

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

$$36) \quad 4^{3x-7} = 32^{2x}$$

$$(2^2)^{3x-7} = (2^5)^{2x}$$

$$2^{6x-14} = 2^{10x}$$

$$6x - 14 = 10x$$
$$\frac{-6x}{-6x} \quad \frac{-6x}{-6x}$$

$$\frac{-14}{4} = \frac{4x}{4}$$

$$x = -\frac{7}{2}$$

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$$18) A = \boxed{200 (1.08)^{12}}$$

$$A \approx 503.6340234$$

$$A \approx \boxed{504 \text{ rats}}$$

$$20) A = \boxed{75 (.96)^{14}}$$

$$A \approx \boxed{42.35049843 \text{ gms}}$$

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$$8) \log_8 y = 7$$

$$\boxed{8^7 = y}$$

$$22) \pi^5 = y$$

$$\boxed{\log_{\pi} y = 5}$$

$$48) \log_2 x = 3$$

$$2^3 = x$$

$$\boxed{x = 8}$$

$$60) \log_{4/3} x = 2$$

$$\left(\frac{2}{3}\right)^2 = x$$
$$\boxed{x = \frac{4}{9}}$$

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$$8) \log_6 3 + \log_6 (x+4) + \log_6 5$$

$$= \log_6 [15(x+4)] = \boxed{\log_6 (15x+60)}$$

$$16) \log_7 (x+9) - \log_7 (x^2+10)$$

$$= \boxed{\log_7 \left[\frac{x+9}{x^2+10} \right]}$$

$$32) \log_8 5 + \log_8 15 - \log_8 20$$

$$= \log_8 \left[\frac{\cancel{5} \cdot 15}{\cancel{20}} \right] = \boxed{\log_8 \left(\frac{15}{4} \right)}$$

$$34) \log_9 (4x) - \log_9 (x-3) + \log_9 (x^3+1)$$

$$= \boxed{\log_9 \left[\frac{4x(x^3+1)}{x-3} \right]}$$

$$38) 5 \log_6 x - \frac{3}{4} \log_6 x + 3 \log_6 x$$

$$= \frac{3^2}{4} \log_6 x - \frac{3}{4} \log_6 x = \frac{29}{4} \log_6 x$$

$$= \boxed{\log_6 \left(x^{\frac{29}{4}} \right)}$$

$$\log_6 2 = 0.43, \log_6 3 = 0.68$$

$$(60) \log_6 81$$

$$= \log_6 (3^4) = 4 \log_6 3$$

$$= 4(0.68) = \boxed{2.72}$$

$$(62) \log_6 \left(\frac{4}{32} \right)$$

$$= \log_6 \left(\frac{1}{8} \right) = \log_6 2^{-3}$$

$$= -3 \log_6 2 = -3(0.43)$$

$$= \boxed{-1.29}$$

$$(64) \log_6 \sqrt{\frac{3}{2}}$$

$$= \frac{1}{2} \log_6 3 - \frac{1}{2} \log_6 2$$

$$= \frac{1}{2}(0.68) - \frac{1}{2}(0.43)$$

$$= \boxed{0.125}$$

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$$34) \log x = 2.1$$

$$10^{2.1} = x$$

$$\boxed{x = 10^{2.1}}$$

$$x \approx 125.8925412$$

$$\boxed{x \approx 125.8925}$$

$$40) \ln(2x+5) = 3.4$$

$$e^{3.4} = 2x + 5$$

$$\frac{e^{3.4} - 5}{2} = \frac{2x}{2}$$

$$\boxed{x = \frac{e^{3.4} - 5}{2}}$$

$$x \approx 12.48205002$$

$$\boxed{x \approx 12.4821}$$

$$54) \log_9 4$$

$$= \boxed{\frac{\log 4}{\log 9}} \approx .6309297536$$

$$\approx \boxed{.6309}$$

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$$6) \quad 8^{x-2} = 12$$

$$\ln(8^{x-2}) = \ln 12$$

$$(x-2) \ln 8 = \ln 12$$

$$x \ln 8 - 2 \ln 8 = \ln 12$$

+ 2 \ln 8 + 2 \ln 8

$$\frac{x \ln 8}{\ln 8} = \frac{2 \ln 8 + \ln 12}{\ln 8}$$

$$x = \frac{2 \ln 8 + \ln 12}{\ln 8}$$

$$x \approx 3.1949875$$

$$\boxed{x \approx 3.1950}$$

$$20) \quad \log_3 x + \log_3 (x+6) = 3$$

$$\log_3 (x^2 + 6x) = 3$$

$$3^3 = x^2 + 6x$$

$$x^2 + 6x = 27$$

-27 -27

$$x^2 + 6x - 27 = 0$$

$$(x+9)(x-3) = 0$$

$$x+9=0 \vee x-3=0$$

$$\underline{-9} \quad \underline{-9}$$

$$\underline{+3} \quad \underline{+3}$$

$$x \neq -9$$

$$\boxed{x=3}$$

$$22) \log_6(x+2) - \log_6 x = 2$$

$$\log_6\left(\frac{x+2}{x}\right) = 2$$

$$6^2 = \frac{x+2}{x}$$

$$x(36 = \frac{x+2}{x})$$

$$36x = x+2$$

$$\underline{-x} \quad \underline{-x}$$

$$\frac{35x}{35} = \frac{2}{35}$$

$$\boxed{x = \frac{2}{35}}$$

$$36) \log_2 x - \log_2(3x+5) = 4$$

$$\log_2\left(\frac{x}{3x+5}\right) = 4$$

$$2^4 = \frac{x}{3x+5}$$

$$(3x+5) \left(16 = \frac{x}{3x+5} \right)$$

$$\begin{array}{r} 48x + 80 = x \\ \underline{-48x} \qquad \qquad \underline{-48x} \end{array}$$

$$\begin{array}{r} 80 = -47x \\ \underline{-47} \qquad \underline{-47} \end{array}$$

$$x = \cancel{-\frac{80}{47}}$$

No Solution

$$48) A = P \left(1 + \frac{r}{n} \right)^{nt}$$

$$\frac{1700}{1500} = \frac{1500}{1500} \left(1 + \frac{10}{2} \right)^{2t}$$

$$\ln\left(\frac{17}{15}\right) = \ln(1.05)^{2t}$$

$$\frac{\ln\left(\frac{17}{15}\right)}{2 \ln(1.05)} = \frac{2t \ln(1.05)}{2 \ln(1.05)}$$

$$t = \frac{\ln\left(\frac{17}{15}\right)}{2 \ln(1.05)}$$

$$t \approx 1.282667778$$

$$t \approx 1.3 \text{ yrs}$$