Agenda for the Class

- Review Test
- Composite Functions
- Exponential Functions

1) $\sqrt{(x-1)^2} = \sqrt{49}$

$x - 1 = \pm 7$

$+1 \quad +1$

$x = 1 \pm 7$ → $1+7 = 8$, $1-7 = -6$

2) $x^2 - 10x + 25 = 64$

$-64 \quad -64$

$x^2 - 10x - 39 = 0$

$(x-13)(x+3) = 0$

$x-13=0 \quad x+3=0$

$x=13 \quad x=-3$

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

$(-10)^2 - 4(1)(-39)$

$100 + 156$

$\sqrt{256} = 16$

$x = \frac{-(-10) \pm 16}{2(1)}$ → $\frac{10+16}{2} = 13$, $\frac{10-16}{2} = -3$

3) $x^2+12x-18=0$

$x^2+12x+36=18+36$

$\sqrt{(x+6)^2}=\sqrt{54}$

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

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

$\left(\frac{12}{2}\right)=(6)^2=36$

54
9 6
3 3 3 2

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

$x=\frac{-(12)\pm 6\sqrt{6}}{2}$

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

$(12)^2-4(1)(-18)$

$144+72$

$\sqrt{216}=6\sqrt{6}$

108 2
12 9
4 3 3 3
2 2

4) $9x^2 - 48x + 64 = 0$

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

$(-48)^2 - 4(9)(64)$

$2304 - 2304$

$\sqrt{0}$

0

$$x = \frac{-(-48) \pm 0}{2(9)} = \frac{48}{18} = \boxed{\frac{8}{3}}$$

5) $x^2+4x+6=0$

$\frac{4}{2}=2^2=4$

$x^2+4x+4=-6+4$

$\sqrt{(x+2)^2}=\sqrt{-2}$

$x+2=\pm i\sqrt{2}$

$x=-2\pm i\sqrt{2}$

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

$(4)^2-4(1)(6)$

$16-24$

$\sqrt{-8}$

$4 \quad 2$

$2i\sqrt{2}$

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

$x=-2\pm i\sqrt{2}$

6) $x^4 - 13x^2 + 36 = 0$ $u = x^2$

$u^2 - 13u + 36 = 0$

$(u-9)(u-4) = 0$

$u-9=0$ $u-4=0$

$u=9$ $u=4$

$\sqrt{x^2}=\sqrt{9}$ $\sqrt{x^2}=\sqrt{4}$

$x=\pm 3$ $x=\pm 2$

$(-13)^2 - 4(1)(36)$

$169 - 144$

$\sqrt{25} = 5$

~~Ax~~ $u = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$u = \dfrac{-(-13) \pm 5}{2(1)}$

$\dfrac{13+5}{2} = \dfrac{18}{2} = 9$

$\dfrac{13-5}{2} = \dfrac{8}{2} = 4$

7) $x - 4\sqrt{x} - 5 = 0$

$u = \sqrt{x}$

$u^2 - 4u - 5 = 0$

$(u-5)(u+1) = 0$

$u = 5 \quad u = -1$

$\sqrt{x} = 5 \rightarrow x = 25$

$\sqrt{x} = -1 \rightarrow x = 1$

$25 - 4\sqrt{25} - 5$

$25 - 20 - 5$

$0 = 0$ ✓

$1 - 4\sqrt{1} - 5$

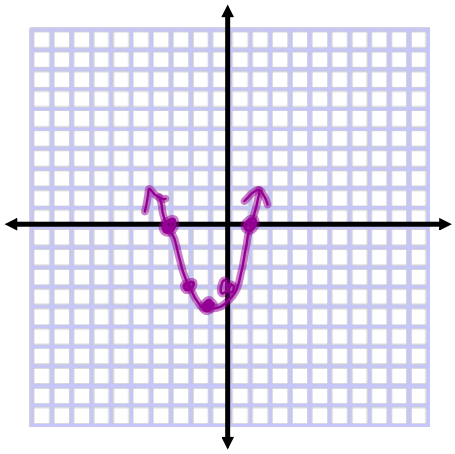
$1 - 4 - 5$

$-8 \neq 0$

8a) $y = (x+1)^2 - 4$

Vertex → $(-1, -4)$

y-Int → $y = (0+1)^2 - 4$
$= 1 - 4$
$y = -3$
$(0, -3)$



x-Int → $(1, 0)$ $(-3, 0)$

$0 = (x+1)^2 - 4$

$\sqrt{4} = \sqrt{(x+1)^2}$

$\pm 2 = x + 1$

$-1 \pm 2 = x$ < $x = -1+2 = 1$, $x = -1-2 = -3$

8b) $y = x^2 - 4x - 5$

A.o.S $\rightarrow \frac{-b}{2a} = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2 = x$

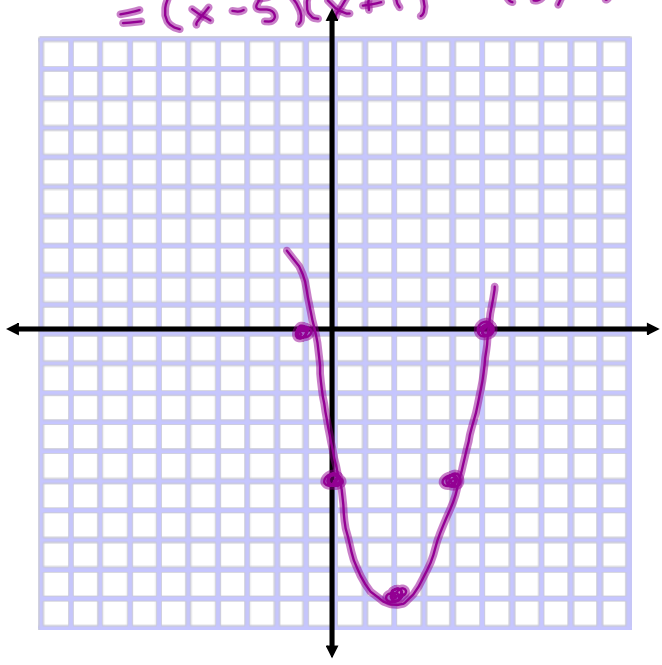
y-Int $\rightarrow (0, -5)$

Vertex $\rightarrow y = (2)^2 - 4(2) - 5$ $(2, -9)$

$= 4 - 8 - 5 = -9$

X-Int $\rightarrow y = x^2 - 4x - 5$ $x = 5$ $x = -1$

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



8c) $y = -2x(x-4)$

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

Vertex $(2, 8)$

A.o.s $= \frac{0+4}{2} = \frac{4}{2} = 2$

x-Int $-2x = 0$ $x = 0$ $(0, 0)$

$x - 4 = 0$ $x = 4$ $(4, 0)$

y-Int $\rightarrow (0, 0)$

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

$= -2(2)(-2)$

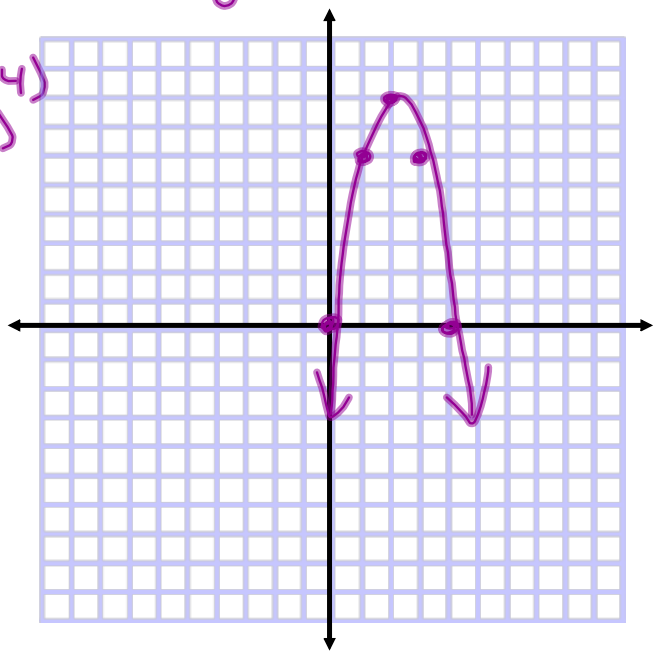
$y = 8$

$x = 1$ $(1, 6)$

$y = -2(1)(1-4)$

$-2(1)(-3)$

$y = 6$



$L + w = 30$

$L = 30 - w$

$L = 30 - 15$

$L = 15 ft$

$A = 225 ft^2$

$A = L \cdot w$

$A = w(30 - w)$

$w = 0 \quad 30 - w = 0$

$w = 30$

$w = \frac{30+0}{2} = 15 ft$

$C(x) = 0.1x^2 - 0.7x + 2.425$

$x = \frac{-b}{2a} = \frac{-(-0.7)}{2(0.1)} = \frac{.7}{.2} = 3.5$

$y = 0.1(3.5)^2 - 0.7(3.5) + 2.425$

$= 1.225 - 2.45 + 2.425$

$= 1.2$

350 Drobos

$120

Composite Functions

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

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

$(fg)(x) = f(x) \cdot g(x) = (2x+3)(x^2-2)$

$f(x) = 2x + 3$

$f(5) = 2(5) + 3$
$= 10 + 3 = 13$

$f(2a) = 2(2a) + 3$
$= 4a + 3$

$f(x+4) = 2(x+4) + 3$
$= 2x + 8 + 3$
$= 2x + 11$

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

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

$(f \circ g)(x)$ $f(x)$ composed of $g(x)$

$(f \circ g)(x) = f(g(x))$

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

$= 2x^2 - 1$

$f(x) = x^2 - 2x + 3 \qquad g(x) = x + 1$

$(f \circ g)(x) = f(g(x))$

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

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

$= x^2 + 2$

$(f \cdot g)(x) = f(g(x))$

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

$= x^2 - 3x - 3x + 9 + 1$

$= x^2 - 6x + 10$

$f(x) = x^2 + 1 \qquad g(x) = x - 3$

$(g \cdot f)(x) = g(f(x))$

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

$= x^2 - 2$

$f(x) = \sqrt{x-1}$ $\quad g(x) = x^2 + 1$

$(f \circ g)(x) = f(g(x))$

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

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

$(g \circ f)(x) = g(f(x))$

$= g(\sqrt{x-1}) = (\sqrt{x-1})^2 + 1$

$= x - 1 + 1 = x$

Exponential Functions

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

$A = 100000\left(1 + \frac{.08}{1}\right)^{1(x)}$

$= 100000\,(1.08)^{x}$

base # > 1 growth

↑ base

$x = 5 \Rightarrow \$146{,}932.81$

$x = 9 \quad \$199900.46$

#55

$P(t)=150(0.960)^t$

base # between 0 and 1 its decay

$P(t)=150(1+-.04)^t$

$t=50 \rightarrow 19,500$

$t=112 \rightarrow 1550$

#52 $N(t) = 3000\,(2)^{t/20}$

$t = 1.5\text{hrs} = 90$ $\Rightarrow 67,882$

Homework

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