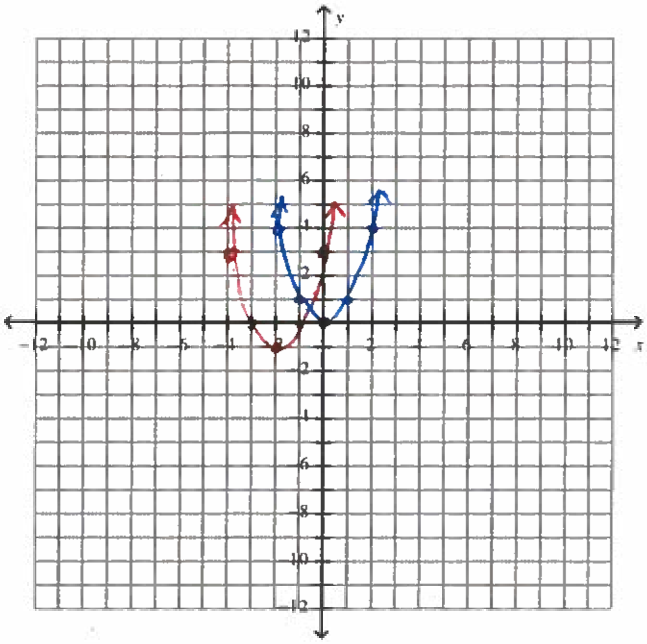
Algebra II Notes Name Key

Graph these families of functions. All functions in #1 (etc) should be graphed on the same coordinate plane. Fill in the blank for the second graph of each set. USE A MINIMUM OF 5 POINTS TO GRAPH!

1. $\begin{cases} y = x^2 \\ y = (x+2)^2 - 1 \end{cases}$



FOR: $y = (x+2)^2 - 1$

Axis of symmetry is $x = -2$.

The vertex is $(-2, -1)$.

The roots are: $x = -3$, $x = -1$ $(-3, 0)$ $(-1, 0)$

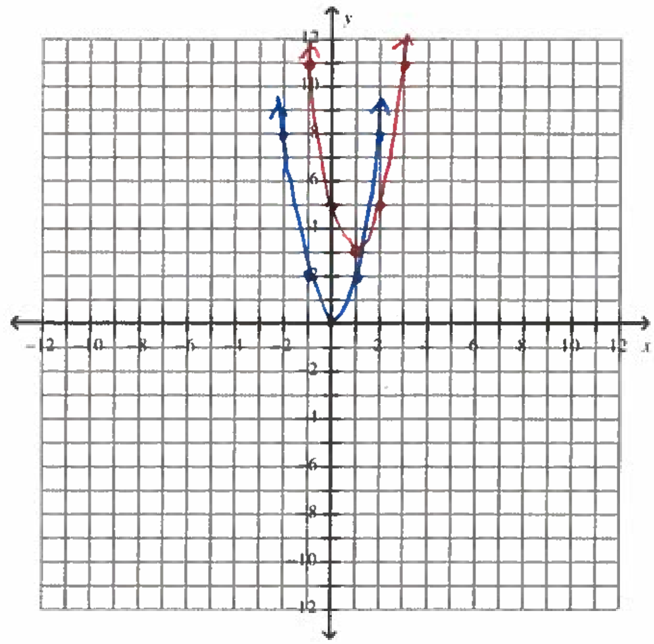
Domain: $(-\infty, \infty)$ Range: $[-2, \infty)$

Increase: $(-2, \infty)$ Decrease: $(-\infty, -2)$

y-intercept: $(0, 3)$ $x = 0$ $y = 3$

Nature of roots: 2 Real Rational Roots

2. $\begin{cases} y = 2x^2 \\ y = 2(x-1)^2 + 3 \end{cases}$



FOR: $y = 2(x-1)^2 + 3$

Axis of symmetry is $x = 1$.

The vertex is $(1, 3)$.

The roots are: imaginary (does not touch x-axis)

Domain: $(-\infty, \infty)$ Range: $[3, \infty)$

Increase: $(1, \infty)$ Decrease: $(-\infty, 1)$

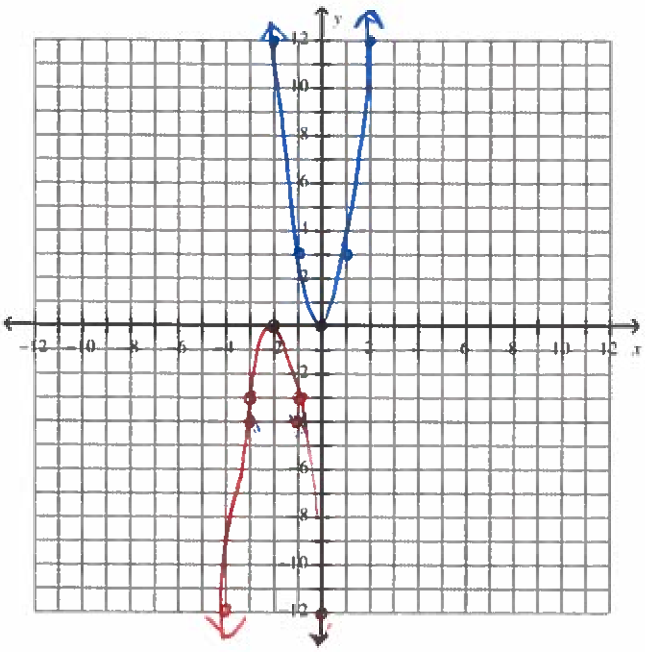
y-intercept: $(0, 5)$

Nature of roots: 2 imaginary roots

Roots

$$2(x-1)^2 + 3 = 0$$
$$2(x-1)^2 = -3$$
$$(x-1)^2 = -3/2$$
$$x - 1 = \pm \frac{\sqrt{-3}}{\sqrt{2}} = \pm \frac{i\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$
$$\boxed{x = 1 \pm \frac{i\sqrt{6}}{2}}$$

3. $\begin{cases} y = 3x^2 \\ y = -3(x+2)^2 \end{cases}$



FOR: $y = -3(x+2)^2$

Axis of symmetry is $x = -2$.

The vertex is $(-2, 0)$.

The roots are: $(-2, 0)$ $x = -2$

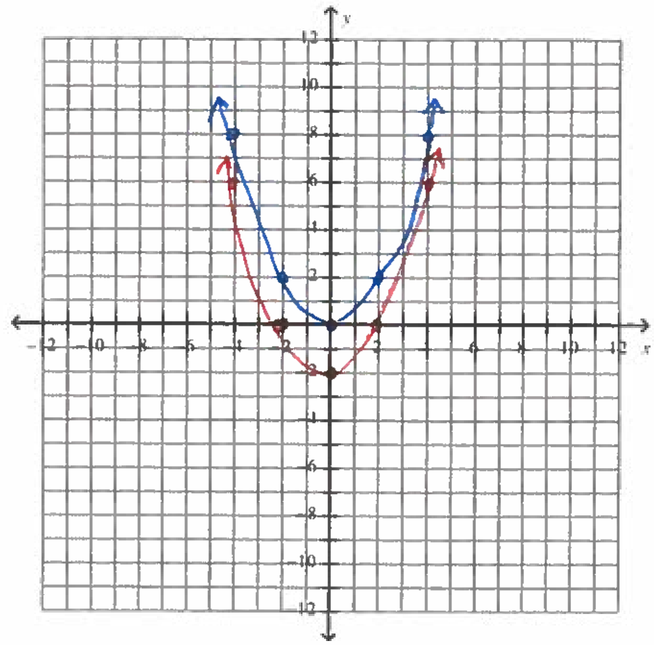
Domain: $(-\infty, \infty)$ Range: $(-\infty, 0]$

Increase: $(-\infty, -2)$ Decrease: $(-2, \infty)$

y-intercept: $(0, -12)$

Nature of roots: 1 Real Rational Double Root

4. $\begin{cases} y = \frac{1}{2}x^2 \\ y = \frac{1}{2}x^2 - 2 \end{cases}$



FOR: $y = \frac{1}{2}x^2 - 2$

Axis of symmetry is $x = 0$ (y-axis).

The vertex is $(0, -2)$.

The roots are: $x = 2$, $x = -2$

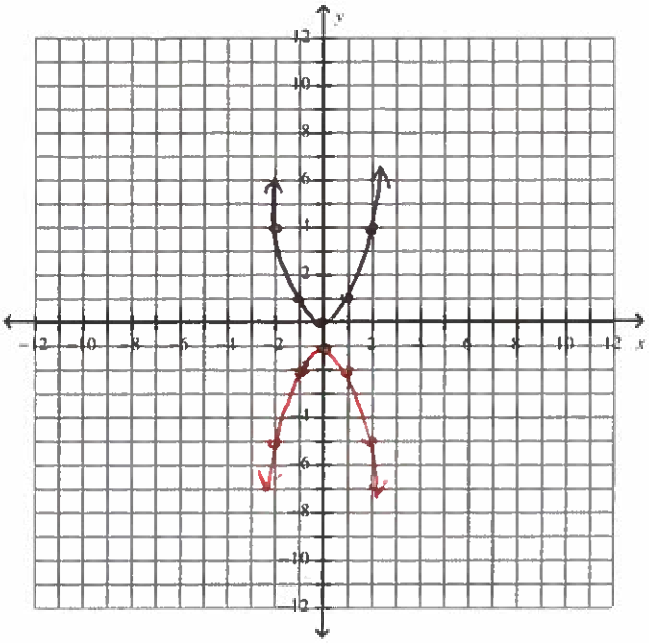
Domain: $(-\infty, \infty)$ Range: $[-2, \infty)$

Increase: $(0, \infty)$ Decrease: $(-\infty, 0)$

y-intercept: $(0, -2)$

Nature of roots: 2 Real Rational Roots

5. $\begin{cases} y = x^2 \\ y = -x^2 - 1 \end{cases}$



FOR: $y = -x^2 - 1$

Axis of symmetry is $x = 0$.

The vertex is $(0, -1)$.

The roots are: 2 imaginary (See below)

Domain: $(-\infty, \infty)$ Range: $(-\infty, -1]$

Increase: $(-\infty, 0)$ Decrease: $(0, \infty)$

y-intercept: $(0, -1)$

Nature of roots: 2 imaginary (conjugates)

Roots

$-x^2 - 1 = 0$

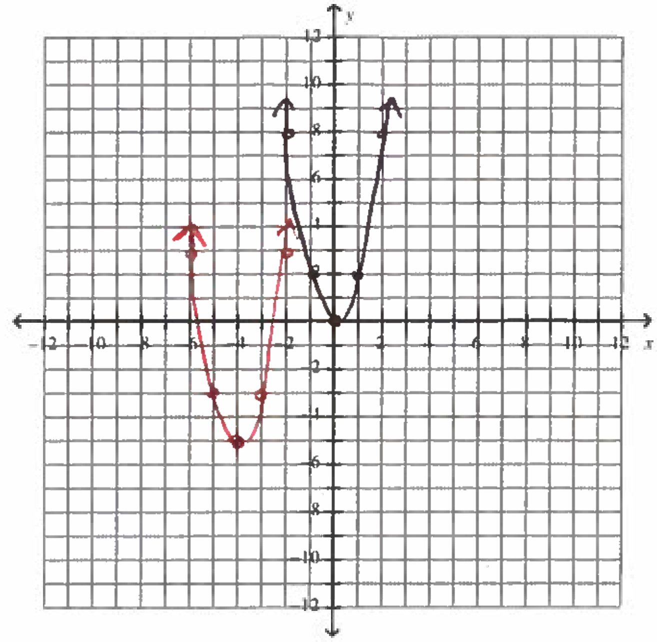
$-x^2 = 1$

$x^2 = -1$

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

$\boxed{x = \pm i}$

6. $\begin{cases} y = 2x^2 \\ y = 2(x+4)^2 - 5 \end{cases}$



FOR: $y = 2(x+4)^2 - 5$

Axis of symmetry is $x = -4$.

The vertex is $(-4, -5)$.

The roots are: (See below)

Domain: $(-\infty, \infty)$ Range: $[-5, \infty)$

Increase: $(-4, \infty)$ Decrease: $(-\infty, -4)$

y-intercept: $x = 0 \Rightarrow y = 27$

Nature of roots: 2 Real Irrational

Roots $2(x+4)^2 - 5 = 0$

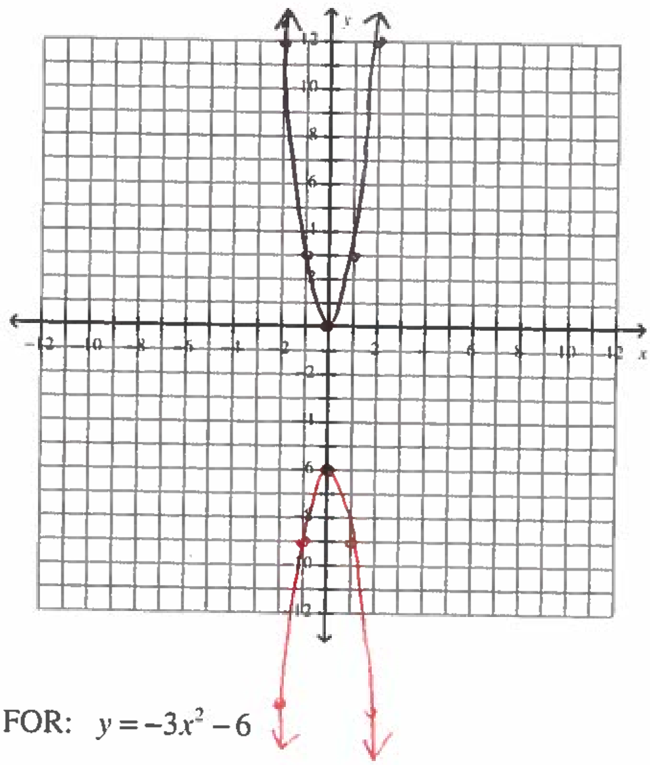
$2(x+4)^2 = 5$

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

$x + 4 = \pm \frac{\sqrt{5}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \pm\frac{\sqrt{10}}{2}$

$\boxed{x = -4 \pm \frac{\sqrt{10}}{2}}$

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



FOR: $y = -3x^2 - 6$

Axis of symmetry is $x = 0$.

The vertex is $(0, -6)$

The roots are: imaginary

Domain: $(-\infty, \infty)$ Range: $(-\infty, -6]$

Increase: $(-\infty, 0)$ Decrease: $(0, \infty)$

y-intercept: $(0, -6)$

Nature of roots: 2 imaginary roots

Roots

$-3x^2 - 6 = 0$

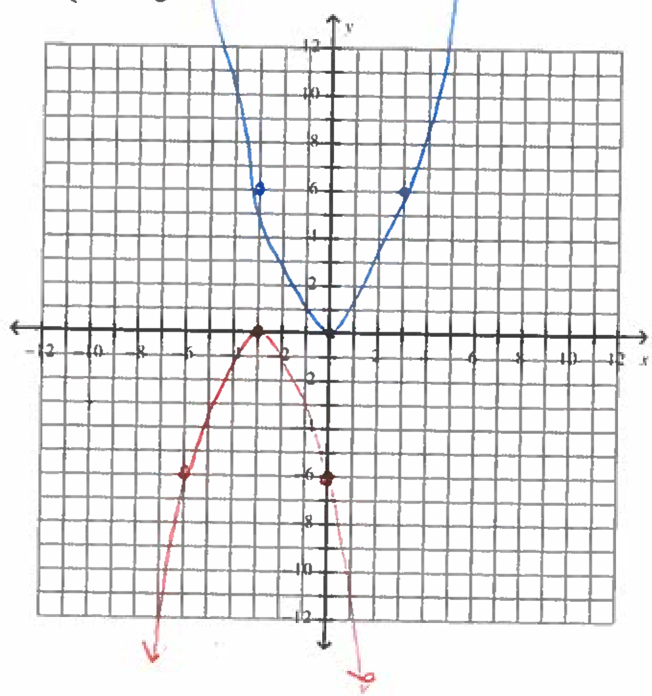
$-3x^2 = 6$

$x^2 = -2$

$x = \pm\sqrt{-2} = \pm\sqrt{-1}\sqrt{2}$

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

8. $\begin{cases} y = \frac{2}{3}x^2 \\ y = -\frac{2}{3}(x+3)^2 \end{cases}$



FOR: $y = -\frac{2}{3}(x+3)^2$

Axis of symmetry is $x = -3$.

The vertex is $(-3, 0)$

The roots are: $x = -3$

Domain: $(-\infty, \infty)$ Range: $(-\infty, 0]$

Increase: $(-\infty, -3)$ Decrease: $(-3, \infty)$

y-intercept: $(0, -6)$

Nature of roots: 1 Real Rat'l Double Roo