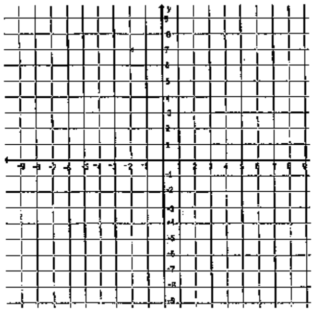
Graphing Polynomials Practice

Name: Key

Example: $P(x) = x^3 - x^2 - 4x + 4$



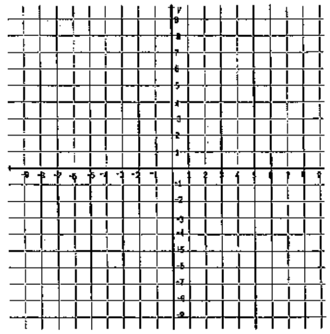
a) Find the zeros by factoring.

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

Factor by grouping because the polynomial has 4 terms.

Set P(x) = 0 and solve.

The zeros of P(x) are -2, 2, and 1.

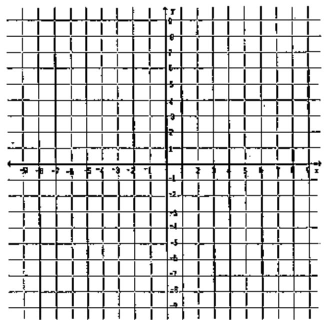


b) Determine end behavior.

As $x \to +\infty$, $P(x) \to +\infty$.
As $x \to -\infty$, $P(x) \to -\infty$.

Because the leading coefficient is positive and the degree is odd, the graph should go up on the right and down on the left.

c) Find the y intercept by plugging in zero for x.
(0,4)

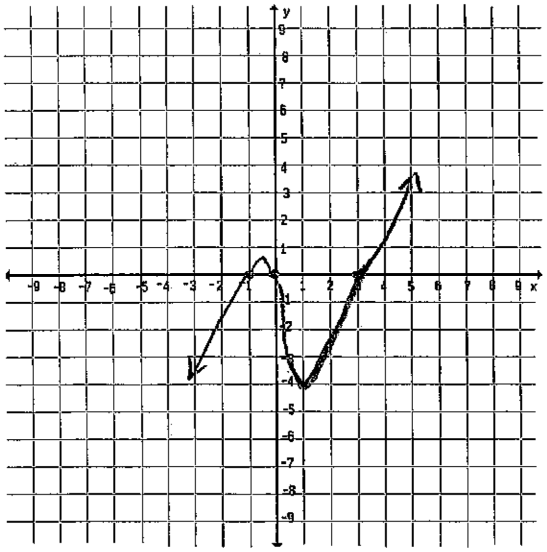


d) Plug in x values between the zeros to find local maxima.

Plug in -1 and 1.5 for x. Plot the resulting ordered pairs. (-1, 6) and (1.5, 0.875).

e) Connect all the points in a smooth curve and you are done!

Graph each of the following below by following the steps above.



1. $P(x) = x^3 - 2x^2 - 3x$

a) $x(x^2 - 2x - 3)$ $(0,0)$ $(3,0)$ $(-1,0)$
$x(x-3)(x+1)$

b) ↙ ↗ As $x \to -\infty$, $y \to -\infty$
As $x \to \infty$, $y \to \infty$

c) $(0,0)$

d) $P(1) = 1^3 - 2(1)^2 - 3(1)$
$1 - 2 - 3$
-4
$(1,-4)$

$(-0.5)^3 - 2(-0.5)^2 - 3(-0.5)$

$(-0.5, 0.875)$

2. $P(x) = -2x^4 - x^3 + 3x^2$

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

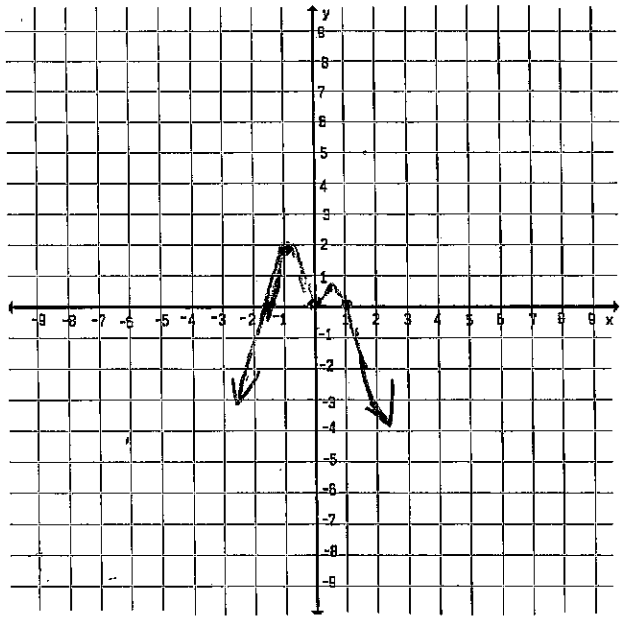
$-x^2(2x+3)(x-1)$

$(0,0)$ $(-3/2, 0)$ $(1,0)$

m of 2   m of 1   m of 1

b) ↙ ↘   As $x \to -\infty$ $y \to -\infty$

$x \to \infty$ $y \to \infty$



c) $(0,0)$

d) $-2(-1)^4 - (-1)^3 + 3(-1)^2$

$(-1, 2)$

$-2(0.5)^4 - (0.5)^3 + 3(0.5)^2$

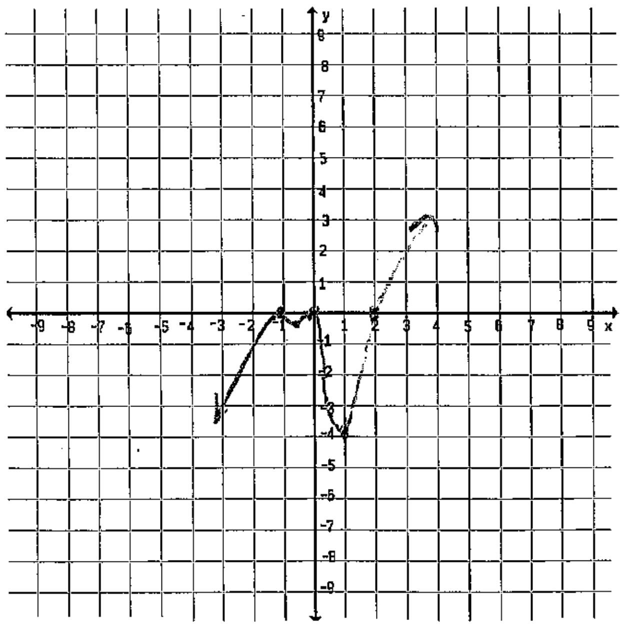
$(0.5, 0.5)$

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

a) $(0,0)$ $(2,0)$ $(-1,0)$

m of 4   m of 3   m of 2

b) ↙ ↗



c) $(0,0)$

d) $(-0.5)^4(-0.5-2)^3(-0.5+1)^2$

$(-0.5, -0.24)$

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

$(1, -4)$

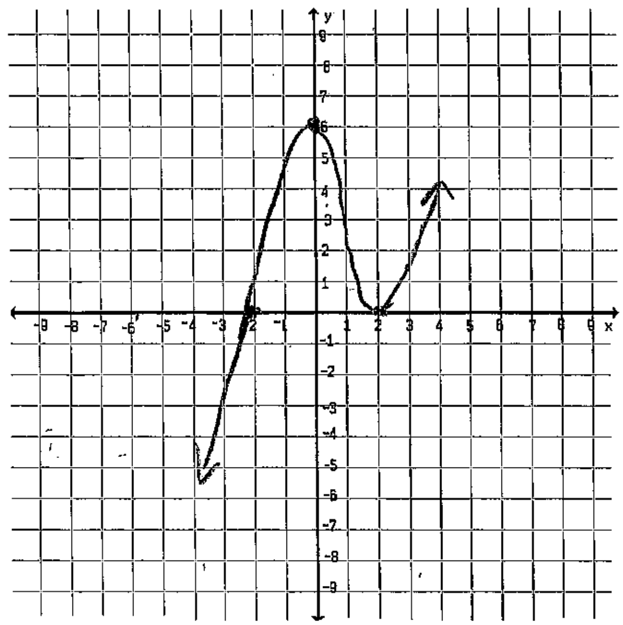
4. $P(x)=(x^3-2x^2)(-4x+8)$

a) $x^2(x-2)-4(x-2)$

$(x^2-4)\quad(x-2)$

$(x+2)(x-2)(x-2)$

$x=-2$ mult 1 $\quad x=2$ mult 2



b) ↙ ↗

c) $(0,8)$

d)

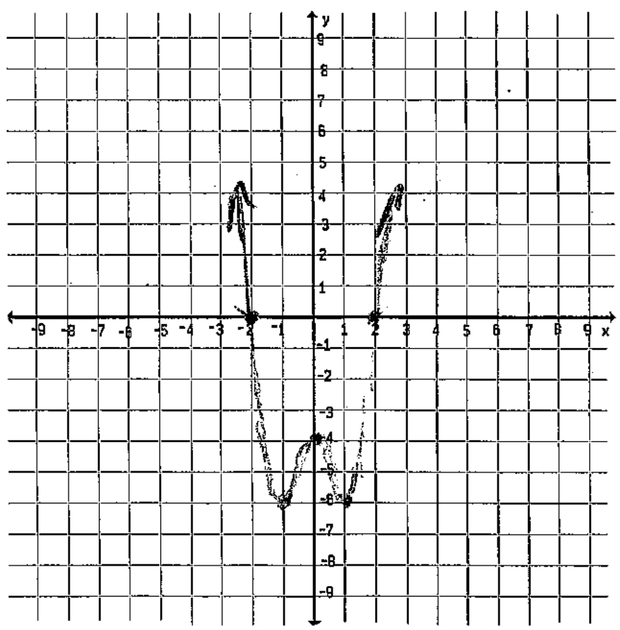
5. $P(x)=x^4-3x^2-4$

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

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

$(-2,0)\ (2,0)$ $\quad \sqrt{x^2}=\sqrt{-1}$

$x=\pm i$



b) ↖ ↗

c) $(0,-4$

d) $(-1)^4-3(-1)^2-4$ $\quad (1)^4-3(1)-4$

$(-1,-6)$ $\quad (1,-6$

Pre-Calculus
Section 2.1 to 2.3 **Review**

Name: Key

Evaluate. **Write answer in a + bi form.**

1.) $(6 + 5i)(-3 - 2i)$

$-18 - 12i - 15i - 10i^2$

$-18 - 27i - 10(-1)$

$-18 - 27i + 10$

$\boxed{-8 - 27i}$

2.) $\dfrac{3}{4+i}\left(\dfrac{4-i}{4-i}\right) = \dfrac{12-3i}{16+1}$

$\dfrac{12-3i}{17} = \boxed{\dfrac{12}{17} - \dfrac{3}{17}i}$

3.) $(5 - 6i) - (3 + 7i)$

$5 - 6i - 3 - 7i$

$\boxed{2 - 13i}$

Find all solutions to the equation. Use factoring, quadratic, etc. **Write answer in a + bi form.**

4.) $49x^2 + 16 = 0$

$-16 \quad -16$

$\dfrac{49x^2}{49} = \dfrac{-16}{49}$

$\sqrt{x^2} = \sqrt{-\dfrac{16}{49}}$

$\boxed{x = \pm\dfrac{4}{7}i}$

$\sqrt{-56} = \sqrt{56}\sqrt{-1}$

$\sqrt{8}\sqrt{7}$

$\sqrt{4}\sqrt{2}$

$2\sqrt{14}i$

5.) $3x^2 = 4x - 6$

$0 = -3x^2 + 4x - 6$

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

$\cancel{(3x \quad)(x \quad)}$

$a = -3 \quad b = 4 \quad c = -6$

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

$= \dfrac{-4 \pm \sqrt{4^2 - 4(-3)(-6)}}{2(-3)}$

$= \dfrac{-4 \pm \sqrt{16 - 72}}{-6}$

$= \dfrac{-4 \pm \sqrt{-56}}{-6}$

$= \dfrac{-4}{-6} \pm \dfrac{2}{-6}i\sqrt{14}$

$\boxed{x = \dfrac{2}{3} + \dfrac{1}{3}i\sqrt{14} \text{ \& } \dfrac{2}{3} - \dfrac{1}{3}i\sqrt{14}}$

6-7 Fill in all of the requested information and draw a graph of the function.

6.) $f(x) = -x^2 + x + 12$

$x = \dfrac{-b}{2a} = \dfrac{-1}{2(-1)} = \dfrac{1}{2}$

$-(\tfrac{1}{2})^2 + (\tfrac{1}{2}) + 12$

$-\tfrac{1}{4} + \tfrac{1}{2} + 12$

Vertex: $(\tfrac{1}{2}, 12.25)$

Max/Min: 12.25

X-Int: $(4,0)$ $(-3,0)$

Y-Int: $(0,12)$

Domain: $\mathbb{R}$

Range: $(-\infty, 12.25)$

$-x^2 + x + 12$

$-(x^2 - x - 12)$

$-(x-4)(x+3)$

$x = 4 \quad x = -3$

7.) $f(x) = (x + 4)^2 + 6$

Vertex: $(-4, 6)$

Max/Min: 6

X-Int: N/A

Y-Int: $(0, 22)$

Domain: $\mathbb{R}$

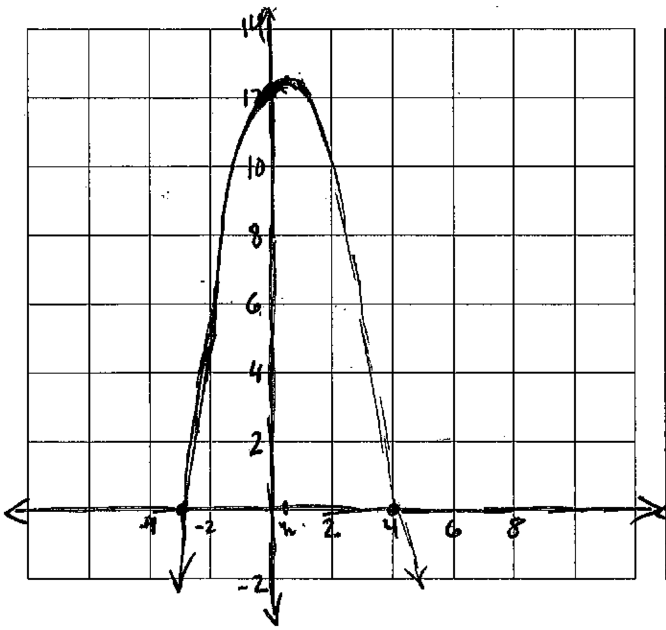
Range: $[6, \infty)$

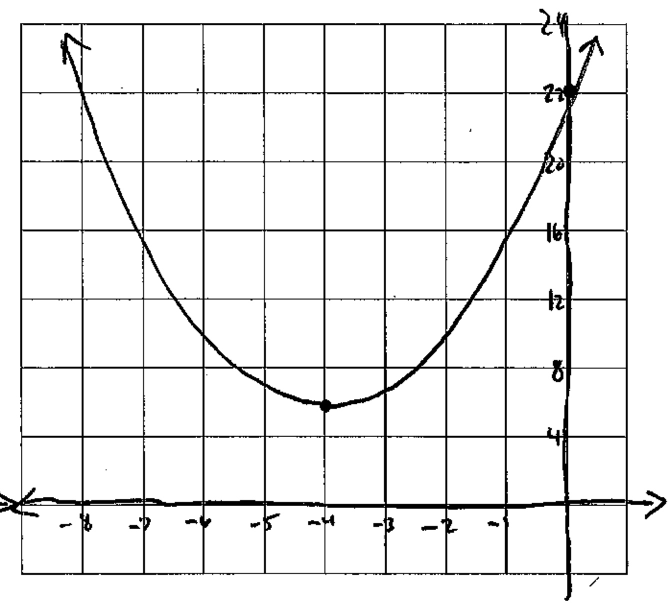
$0 = (x+4)^2 + 6$

$-6 \qquad -6$

$\sqrt{-6} = \sqrt{(x+4)^2}$

$i\sqrt{6} = x + 4$





8.) **When a football is kicked, the height of the football, in feet, can be modeled by $f(x) = -0.04x^2 + 2.3x + 1.5$, where x is the horizontal distance, in feet, from the point of impact with the kickers foot. What is the maximum height of the punt and how far from the point of impact does this occur? If the ball is not blocked, how far down the field will it go before hitting the field?**

$a = -0.04 \quad b = 2.3 \quad c = 1.5$

Max Height: 34.56ft

How far from impact did it occur: [redacted] 28.75ft

How far down the field will it go: 58.125 ft

$$x = \frac{-2.3 \pm \sqrt{(2.3)^2 - 4(-0.04)(1.5)}}{2(-0.04)}$$

$$x = \frac{-2.3 \pm \sqrt{5.53}}{-0.08}$$

$$x = \frac{-2.3 + 2.35}{-0.08} \quad \& \quad x = \frac{-2.3 - 2.35}{-0.08}$$

$$x = -0.625 \qquad x = 58.125$$

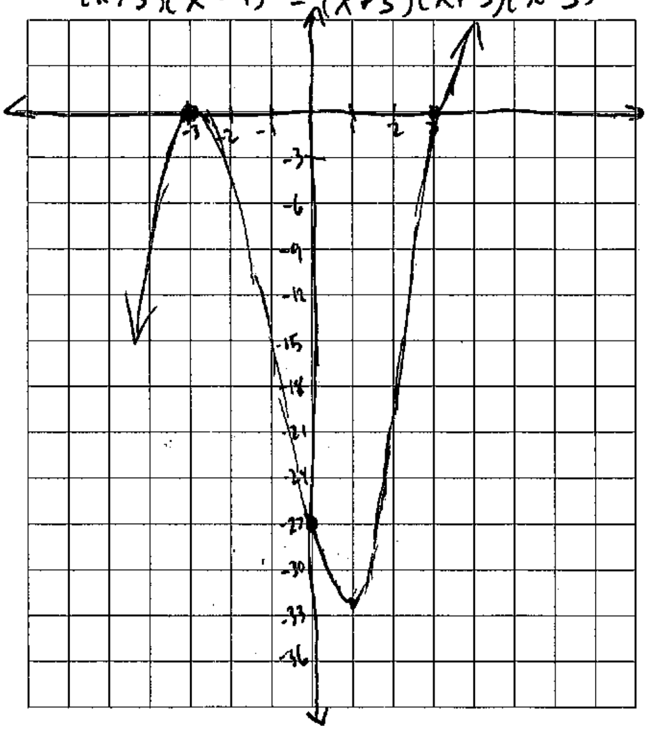
$$\frac{-b}{2a} = \frac{-2.3}{2(-0.04)} = \text{[redacted]} \; 28.75ft$$

$$f(x) = -0.04(28.75)^2 + 2.3(28.75) + 1.5$$
$$-33.0625 + 66.125 + 1.5$$
$$f(x) = 34.5625$$

9.) $p(x) = (x^3 + 3x^2)(-9x - 27)$

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

$(x+3)(x^2-9) = (x+3)(x+3)(x-3)$

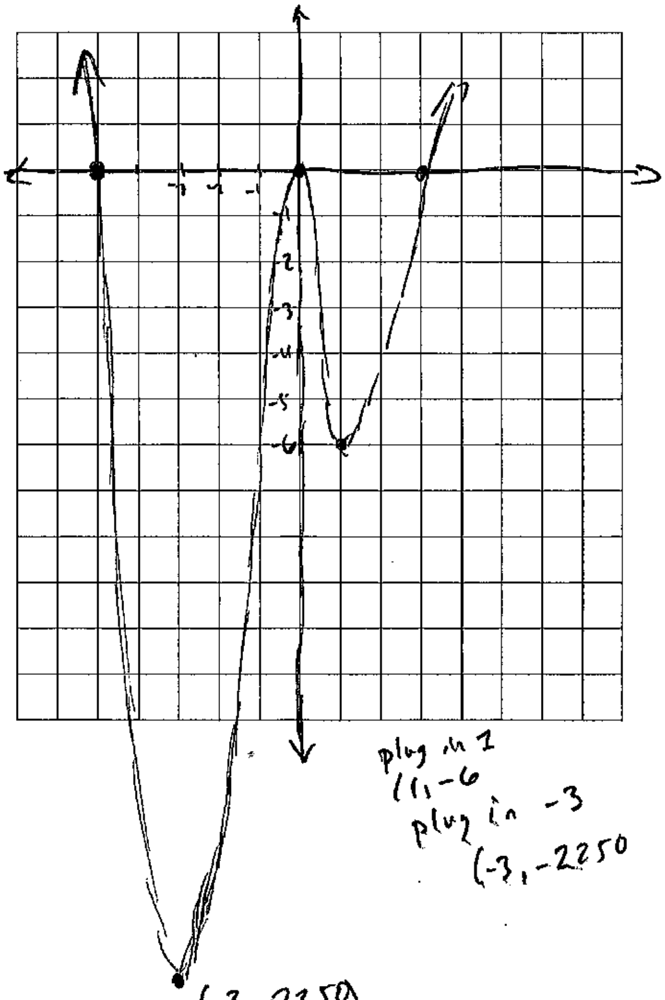


Zeros $x = -3$ m of 2 $\quad x = 3$ m of 1 $\quad$ plug in 1 $(1, -32)$

Y-int = -27 $(0, -27)$

10.) $p(x) = x^2(x-2)^3(x+5)$

$x = 0$ m of 1 $\quad x = 2$ m of 3 $\quad x = -5$ m of 1



plug in 1 $(1, -6$

plug in -3 $(-3, -2250$

$(-3, -2250)$