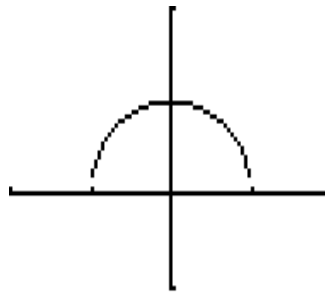


Section 2.1

1) $[-1, 1]$

$$y_1 = \sqrt{1 - x^2}$$

$[-2, 2]$ by $[-1, 2]$



1. On paper:

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

$$1 - x^2 \geq 0$$

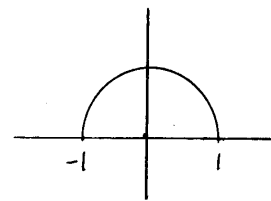
$$(1 - x)(1 + x) \geq 0$$

--	+	++	1+x
+	+	--	1-x
	N	P	N

Domain $[-1, 1]$

$$y_1 = \sqrt{1 - x^2}$$

$[-2, 2]$ by $[-1, 2]$

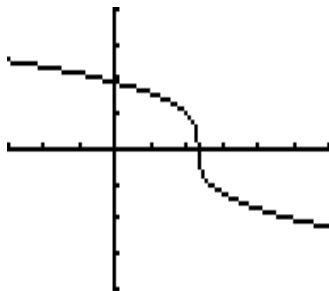


Domain $[-1, 1]$

3) $(-\infty, \infty)$

$$y_1 = (7 - 3x)^{1/3}$$

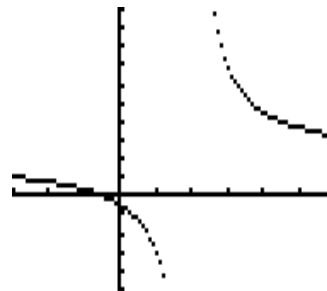
$[-3, 6]$ by $[-4, 4]$



5) $(-\infty, 2) \cup (2, \infty)$

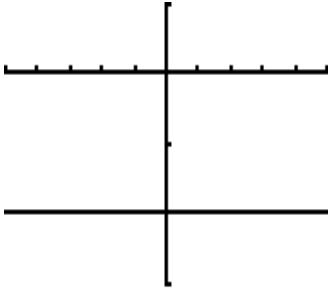
$$y_1 = (2x + 1)/(x - 2)$$

$[-3, 6]$ by $[-5, 10]$



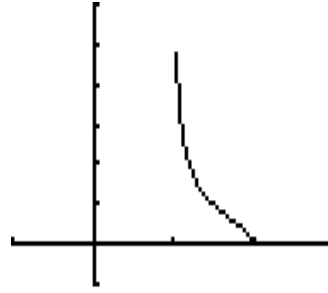
7) $(-\infty, \infty)$

$y_1 = -2, \quad [-5, 5] \text{ by } [-3, 1]$



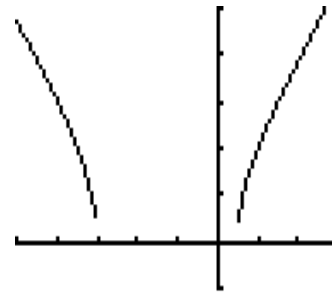
9) $(1, 2]$

$y_1 = \sqrt{(x-2)/(1-x)} \quad [-1, 3] \text{ by } [-1, 6]$



11) $(-\infty, -3] \cup [\frac{1}{2}, \infty)$

$y_1 = \sqrt{(2x^2 + 5x - 3)} \quad [-5, 3] \text{ by } [-1, 5]$



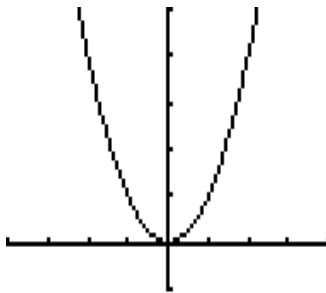
Section 2.2

1. Domain $(-\infty, \infty)$, Range $[-1, \infty)$

3. Domain $(-\infty, -1] \cup [1, \infty)$, Range $(-\infty, 0]$

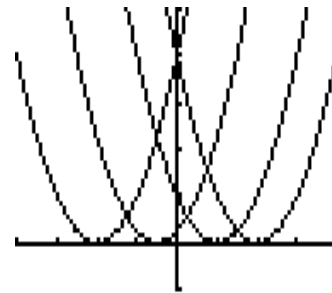
5. window $[-4, 4] \text{ by } [-1, 5]$

$y_1 = x^2$



```

Plot1 Plot2 Plot3
\Y1=(X-(-2,-.5,1
,2))^2
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
    
```



The vertex of the parabola moves left or right along the x -axis c units. When c is negative, the vertex moves to the left of the origin. When c is positive, the vertex moves to the right of the origin.

When you transfer the graphs of piecewise-defined functions to paper, open or closed circles, \circ or \bullet , must be included appropriately on the graph, even though the calculator graph does not indicate these points.

7. window $[-3, 3]$ by $[-5, 5]$

To find the \circ or \bullet points:

Using $y = 3x + 1$, if $x = 1$, we have $y = 4$, so we have an open circle at $(1, 4)$

since $x \neq 1$ for this piece.

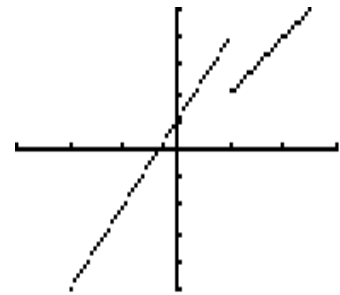
When $x = 1$, $y = 2x$ so $y = 2$, giving a closed circle at $(1, 2)$

These points must be shown

appropriately on the paper graph. TI-89: $y_1 = \text{when}(x < 1, 3x + 1, 2x)$

```

Plot1 Plot2 Plot3
\Y1=(3X+1)(X<1)+
(2X)(X≥1)
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
    
```

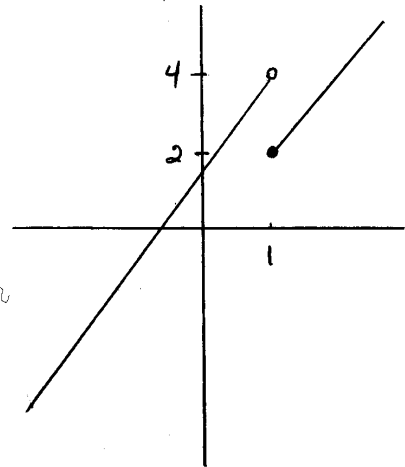


7. On paper:

$$f(x) = \begin{cases} 3x+1 & \text{if } x < 1 \\ 2x & \text{if } x \geq 1 \end{cases}$$

$$y_1 = (3x+1)(x < 1) + (2x)(x \geq 1)$$

$[-3, 3]$ by $[-5, 5]$



Calculator will not show \circ or \bullet . You must add these points.

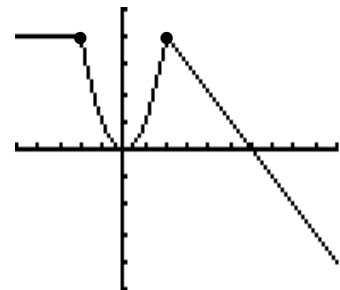
9. window $[-5, 10]$ by $[-5, 5]$

Let $x = -2$ when $y = 4$, we get \circ at $(-2, 4)$. Let $x = 2$ when $y = -x + 6$, we get \circ at $(2, 4)$. Let $x = -2$ and $x = 2$, with $y = x^2$ we have \bullet at $(-2, 4)$ and $(2, 4)$. So, both points are filled in with \bullet .

Show \bullet on paper graph.

```

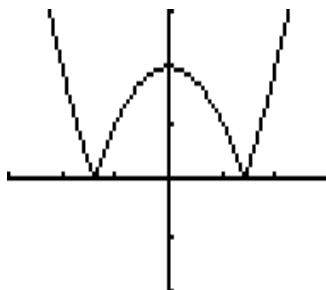
Plot1 Plot2 Plot3
\Y1=4(X<-2)+X^2(
X≥-2)(X≤2)+(-X+6
)(X>2)
\Y2=
\Y3=
\Y4=
\Y5=
    
```



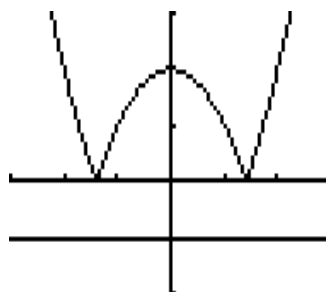
TI-89: $y_1 = \text{when}(x < -2, 4, \text{when}(x \leq 2, x^2, -x + 6))$

11. $|x^2 - 2| = k$

$y_1 = \text{abs}(x^2 - 2)$
 $[-3, 3]$ by $[-2, 3]$



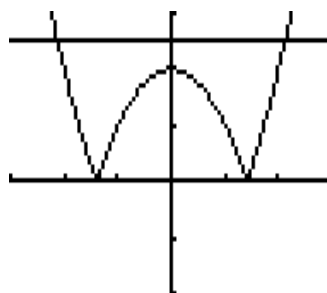
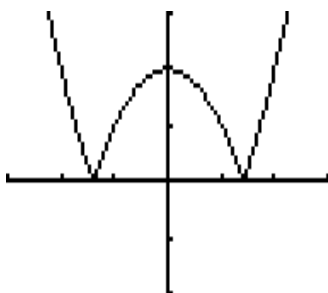
We have 0 solutions when $k < 0$.
 For example, $k = -1$,
 and graph $y_2 = -1$
 So, any negative value will
 yield an equation with no solution.



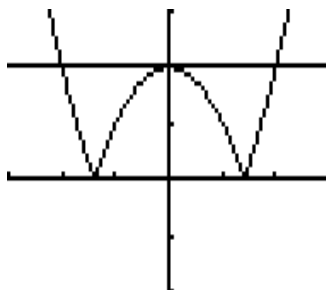
We have 2 solutions when $k = 0$ or $k > 2$.

For $k = 0$,
 we see two x -intercepts.

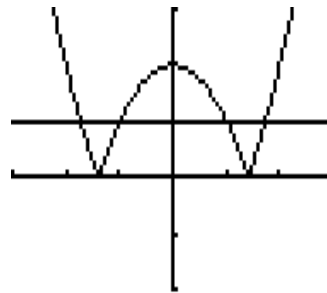
For $k = 2.5$, $y_2 = 2.5$
 we have exactly 2 solutions.



We have 3 solutions when $k = 2$.
 For example, $k = 2$, $y_2 = 2$



We have 4 solutions when $0 < k < 2$.
 For example, $k = 1$, $y_2 = 1$



There are no values of k that yield exactly one solution.

So, to recap, we have

- 0 solutions when $k < 0$
- 2 solutions when $k = 0$ or $k > 2$
- 3 solutions when $k = 2$
- 4 solutions when $0 < k < 2$

Section 2.3

1. increasing $[-1.87, 0] \cup [.97, \infty)$
 decreasing $(-\infty, -1.87] \cup [0, .97]$

$$y_1 = 0.25x^4 + 0.3x^3 - 0.9x^2 + 3$$

$[-4, 3]$ by $[-1, 6]$



minimum values occur at $x = -1.865099, 0.9650954$
 maximum value occurs at $x = 0$

3. increasing $(-\infty, -1.16] \cup [2.16, \infty)$
 decreasing $[-1.16, 2.16]$

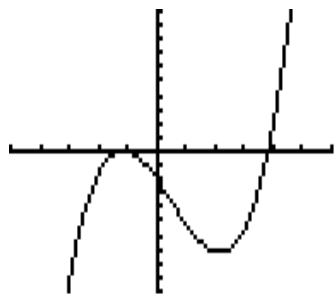
Calculator:

$$y_1 = 0.4x^3 - 0.6x^2 - 3x - 2$$

$[-5, 6]$ by $[-10, 10]$

maximum value occurs at $x = -1.158312$

minimum value occurs at $x = 2.158312$

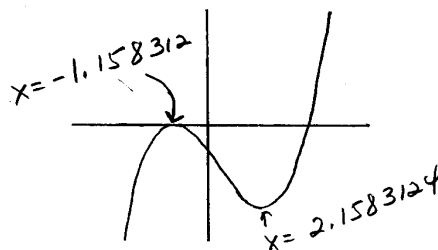


On paper:

$$f(x) = .4x^3 - .6x^2 - 3x - 2$$

$$y_1 = .4x^3 - .6x^2 - 3x - 2$$

$[-5, 6]$ by $[-10, 10]$



increasing $(-\infty, -1.16] \cup [2.16, \infty)$
 decreasing $[-1.16, 2.16]$

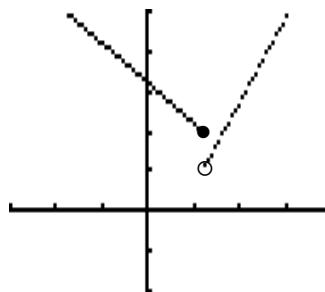
5. increasing $(1.2, \infty)$
 decreasing $(-\infty, 1.2]$

$$y_1 = (3.2 - x)(x \leq 1.2) + (2.1x - 1.5)(x > 1.2)$$

$[-3, 4]$ by $[-2, 5]$

Show \circ or \bullet on graph on paper.

TI-89: $y_1 = \text{when}(x \leq 1.2, 3.2 - x, 2.1x - 1.5)$



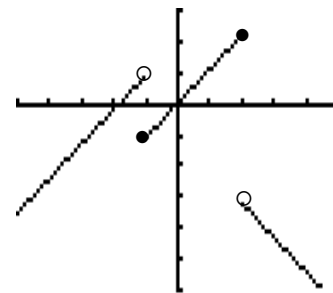
7. increasing $(-\infty, -1) \cup [-1, 2]$
 decreasing $(2, \infty)$

$$y_1 = (1.1x + 2)(x < -1) + 1.1x(x \geq -1)(x \leq 2) + (-1.1x - 1)(x > 2)$$

$[-5, 5]$ by $[-6, 3]$

Show \circ or \bullet on graph on paper.

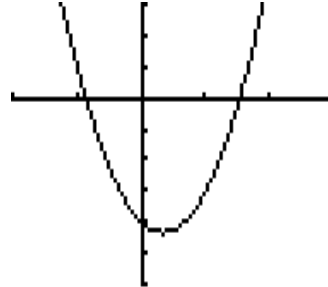
TI-89: $y_1 = \text{when}(x < -1, 1.1x + 2, \text{when}(x \leq 2, 1.1x, -1.1x - 1))$



9. decreasing $(-\infty, 0.33]$, increasing $[0.33, \infty)$

$$y_1 = \text{abs}(3x^2 - 2x + 1) - 5, \quad [-2, 3] \text{ by } [-6, 3]$$

minimum value occurs at $x = 0.33333333$

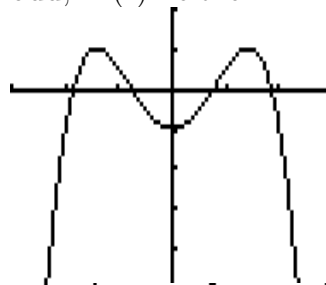


Section 2.4

1. (a) neither, (b) odd, (c) even, (d) even, (e) odd, (f) neither

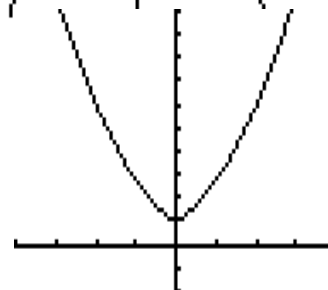
3. even

$$y_1 = -0.5x^4 + 2x^2 - 1 \quad [-3, 3] \text{ by } [-5, 2]$$



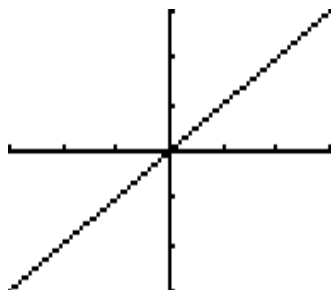
5. even

$$y_1 = 0.75x^2 + \text{abs}(x) + 1 \quad [-4, 4] \text{ by } [-2, 10]$$

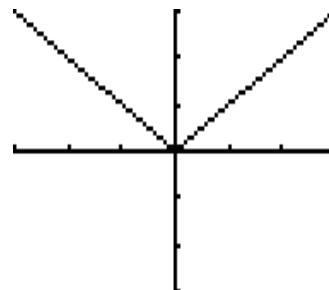


7. The part of $f(x) = x$ below the x -axis (where $y < 0$) is reflected over the x -axis.

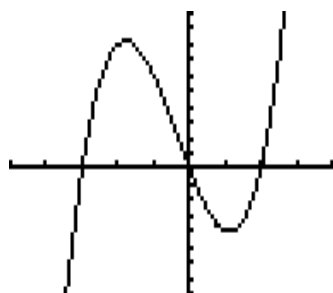
$$y_1 = x \quad [-3, 3] \text{ by } [-3, 3]$$



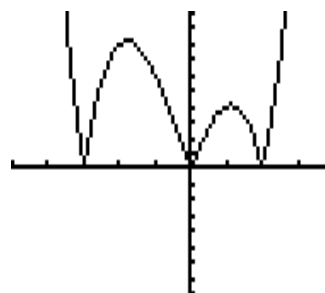
$$y_1 = \text{abs}(x) \quad [-3, 3] \text{ by } [-3, 3]$$



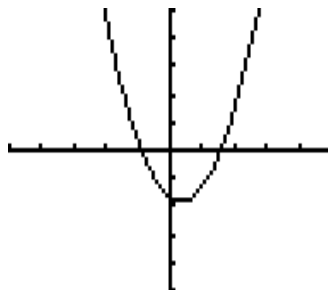
9. (a) $y_1 = x^3 + x^2 - 6x$
 $[-5, 4] \text{ by } [-8, 10]$



(d) $y_1 = \text{abs}(x^3 + x^2 - 6x)$
 $[-5, 4] \text{ by } [-8, 10]$

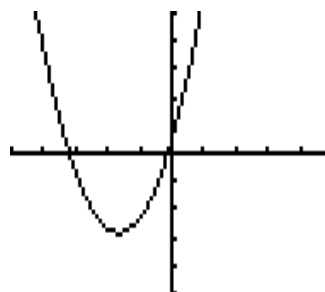


11. $y_1 = 1.2x^2 - 0.8x - 1.7$
 $[-5, 5]$ by $[-5, 5]$



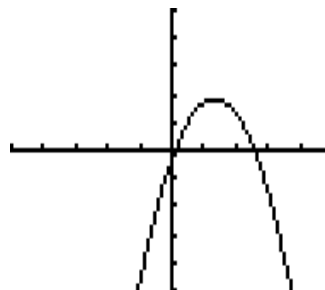
(a) $g(x) = f(x + 2) - 1$

$y_1 = 1.2(x + 2)^2 - 0.8(x + 2) - 1.7 - 1$
 shift left 2 units, down 1 unit



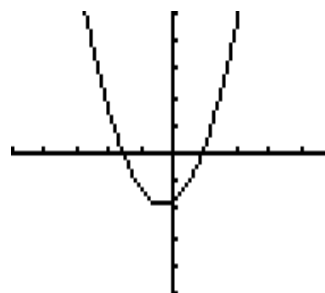
(b) $h(x) = -f(x - 1)$

$y_1 = -(1.2(x - 1)^2 - 0.8(x - 1) - 1.7)$
 reflect over x -axis, shift right 1 unit



(c) $j(x) = f(-x)$

$y_1 = 1.2(-x)^2 - 0.8(-x) - 1.7$
 reflect over y -axis



Section 2.7

1. (a) $[-3, 3]$, (b) $[-3, -1.9) \cup (-1.9, 3]$, (c) $[-3, -2.7) \cup (-2.7, .4) \cup (.4, 3]$

3. (a) $f(g(-3)) = f(3) = -1$

(b) $x = 3$

Working backwards for $g(f(x)) = 2$:

$$\boxed{?} \rightarrow f \rightarrow \boxed{?} \rightarrow g \rightarrow \boxed{2}$$

For $g(x)$, what x -value yields an answer of $y = 2$?

$$\boxed{?} \rightarrow f \rightarrow \boxed{-1} \rightarrow g \rightarrow \boxed{2}$$

$$g(-1) = 2$$

Now for $f(x)$ what x -value yields an answer of $y = -1$?

$$\boxed{3} \rightarrow f \rightarrow \boxed{-1} \rightarrow g \rightarrow \boxed{2}$$

$$f(3) = -1$$

so, $g(f(3)) = 2$, and $x = 3$ is our answer

(c) $x = 4$

Working backwards for $f(f(x)) = -2$:

$$\boxed{?} \rightarrow f \rightarrow \boxed{?} \rightarrow f \rightarrow \boxed{-2}$$

For $f(x)$ what x -value yields an answer of $y = -2$?

$$\boxed{?} \rightarrow f \rightarrow \boxed{1} \rightarrow f \rightarrow \boxed{-2}$$

$$f(1) = -2$$

Now for $f(x)$ what x -value yields an answer of $y = 1$?

$$\boxed{4} \rightarrow f \rightarrow \boxed{1} \rightarrow f \rightarrow \boxed{-2}$$

$$f(4) = 1$$

so, $f(f(4)) = -2$, and $x = 4$ is our answer

5. Domain is all real numbers $x \geq 5$ and $x \neq a^2 + 5$

On paper:

$f(x) = \frac{2}{x+a}$ $g(x) = \sqrt{x-5}$
 $(f \circ g)(x)$

$g(x) = \sqrt{x-5}$ $f(x) = \frac{2}{x+a}$

$x \geq 5$ $x \neq -a$
 $\Rightarrow y \neq -a$

$\sqrt{x-5}$
 $x-5 \geq 0$
 $x \geq 5$

$\frac{2}{x+a} \quad x \neq -a$

Also need $\sqrt{x-5} \neq -a$
 $\sqrt{x-5} = -a$
 $x-5 = a^2$
 $x = a^2 + 5$
 Thus, $x \neq a^2 + 5$

alternate method

$$f(g(x)) = f(\sqrt{x-5}) = \frac{2}{\sqrt{x-5} + a}$$

$$\text{So, } \sqrt{x-5} + a = 0$$

$$\sqrt{x-5} = -a$$

← same equation,
so $x \neq a^2 + 5$

We also know
 $x \geq 5$ for $\sqrt{x-5}$

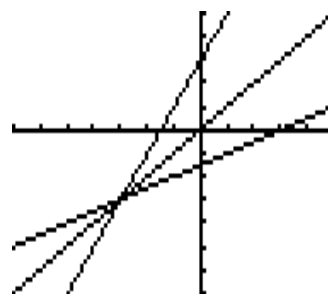
Domain is all real numbers for which $x \geq 5$ and $x \neq a^2 + 5$

Remember, $-a$ does not mean we have a negative number. If a is negative, then $-a$ is positive.

Section 2.8

1. $f^{-1}(x) = \frac{1}{2}(x-3)$

$y_1 = 2x + 3$, $y_2 = 1/2(x-3)$, $y_3 = x$
 $[-5, 5]$ by $[-5, 5]$



3. $f(x)$ and $h(x)$ are symmetric about $y = x$

$$y_1 = (x \wedge 3 + 4) \wedge (1/3) - 2$$

$$y_2 = (x \wedge 3 + 2) \wedge (1/3) - 4$$

$$y_3 = ((x + 2) \wedge 3 - 4) \wedge (1/3)$$

$[-4, 4]$ by $[-6, 4]$

Show $f(h(x)) = x$ and $h(f(x)) = x$

