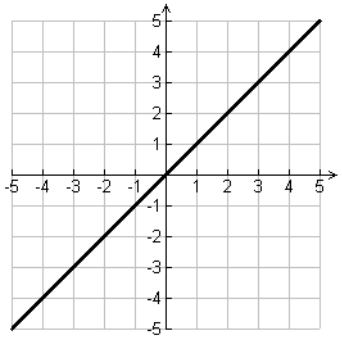
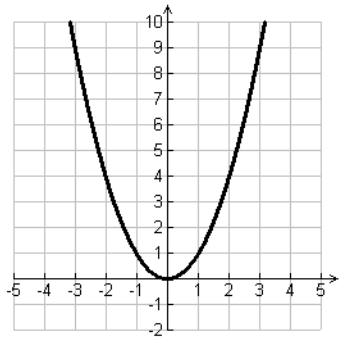
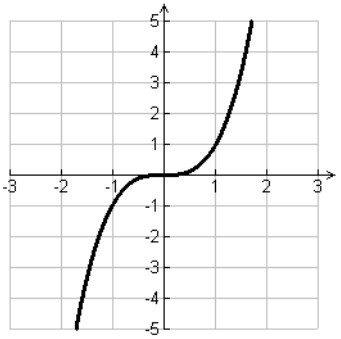
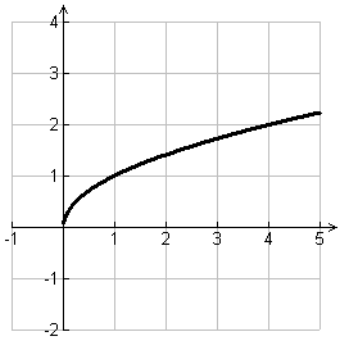
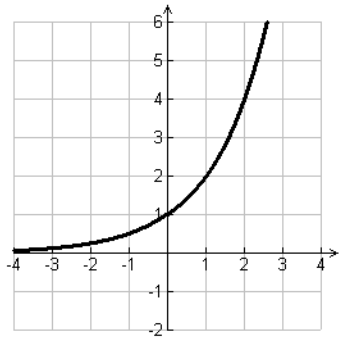
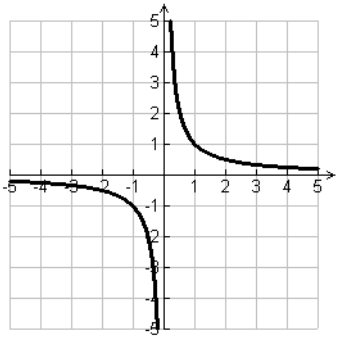
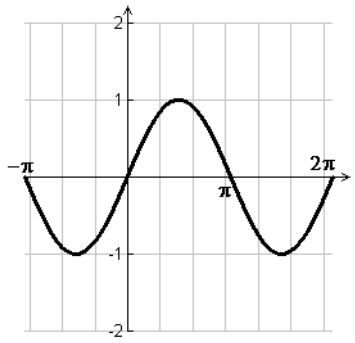
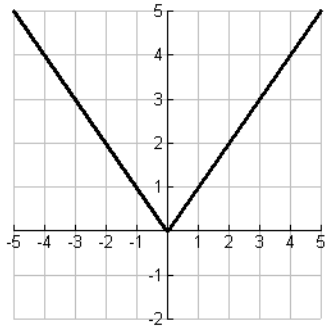
Lesson 3 – Handout – Properties of Graphs of Functions

Recall: Toolkit of Parent Functions

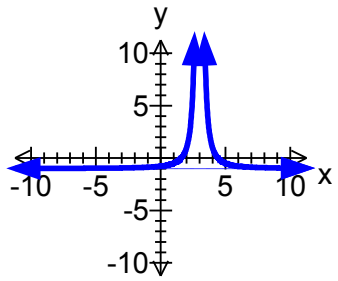
Linear: $y=x$ 	Quadratic: $y=x^2$ 	Cubic: $y=x^3$ 
Radical: $y=\sqrt{x}$ 	Exponential: $y=2^x$ 	Reciprocal: $y=\frac{1}{x}$ 
Sinusoidal: $y=\sin x$ 	Absolute Value: $y=\lvert x\rvert$ 	**Note**: There are many types of functions other than the ones shown here.

Useful Definitions:

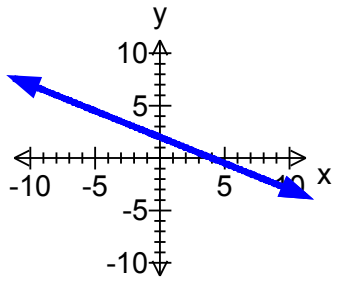
- Interval(s) of Increase: interval(s) where y increases as x increases.
- Interval(s) of Decrease: interval(s) where y decreases as x increases.
- Turning Point: point where the function changes from increasing to decreasing, or vice versa.
- Even Function: function that is symmetric about the y-axis (i.e., $f(-x)=f(x)$).
- Odd Function: function that is *rotationally symmetric* about the origin (i.e., $f(-x)=-f(x)$).
- Continuous Function: function with no holes or breaks in its graph.
- Discontinuous Function: function with at least one hole or break in its graph.

Lesson 3 – Handout – Properties of Graphs of Functions

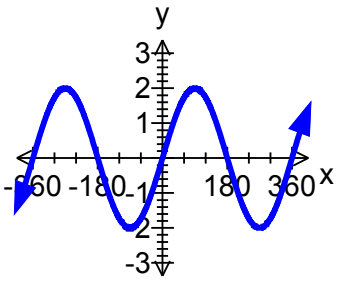
Exercise 1: Match each function with a characteristic of its graph. Each number may only be used once.



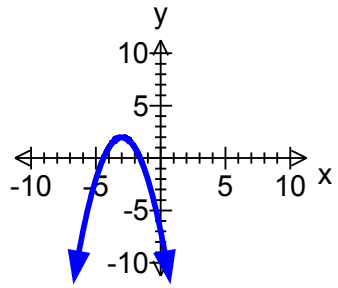
$y=\frac{2}{(x-3)^2}-1$



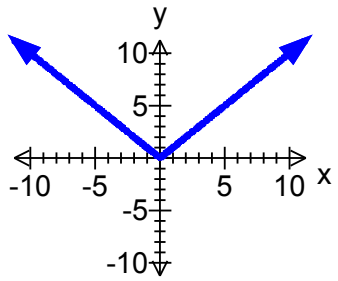
$y=-\frac{1}{2}+2$



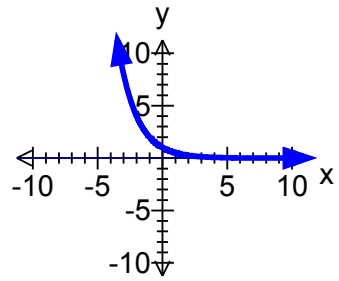
$y=2\sin x$



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



$y=|x|$



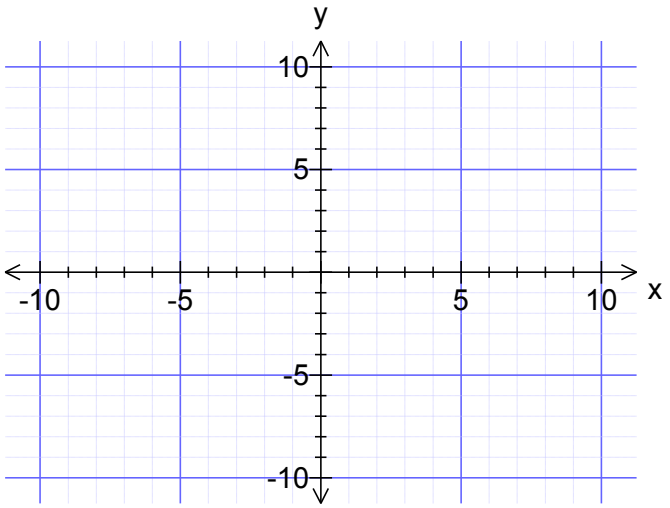
$y=\left(\frac{1}{2}\right)^x$

Characteristics:

1. Domain: $\{x\in\mathbb{R}\}$
2. Range: $\{y\in\mathbb{R}\}$
3. One Turning Point
4. As $x\to\infty, y\to-1$
5. Range: $\{y\in\mathbb{R}|y\geq 0\}$
6. As $x\to-\infty, y\to\infty$

Exercise 2: Sketch a possible function for the following characteristics.

- Domain: $\{x\in\mathbb{R}\}$
- Range: $\{y\in\mathbb{R}\}$
- Increasing on intervals:
  - $(-\infty,-3)$ or $-\infty<x<-3$
  - $(2,\infty)$ or $2<x<\infty$
- Decreasing on intervals:
  - $(-3,2)$ or $-3<x<2$
- Turning Points (x,y) at:
  - $(-3,1)$ and $(2,-4)$



What type of function is this?