

**Activity 3: Characteristics of Odd and Even functions****Homework**

For each of the following functions, classify each as: even, odd or neither. You must show your work to prove your classification. If you are experiencing difficulty, contact your teacher.

1. Show a proof algebraically

a)  $f(x) = x^2 - 2x$

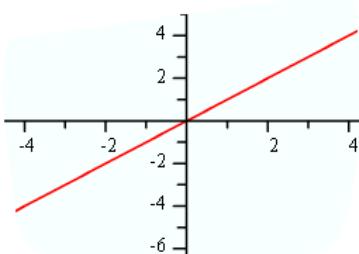
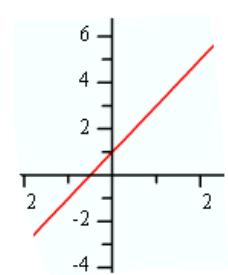
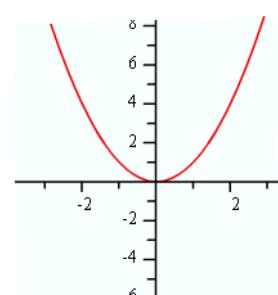
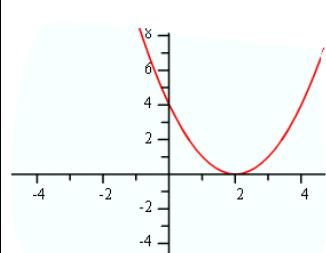
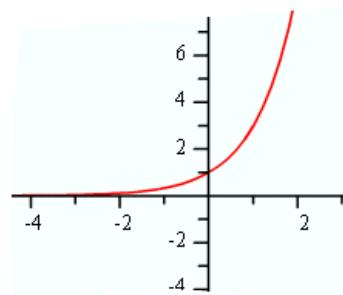
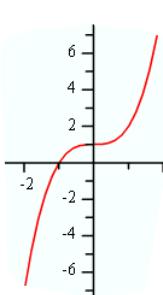
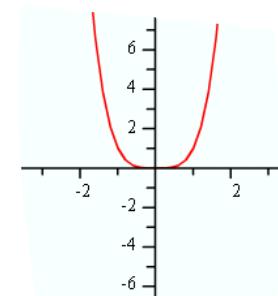
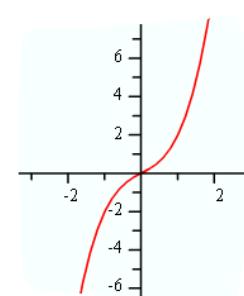
b)  $f(x) = 3x^5 - 4x$

c)  $f(x) = \frac{1}{x^2 + 5}$

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

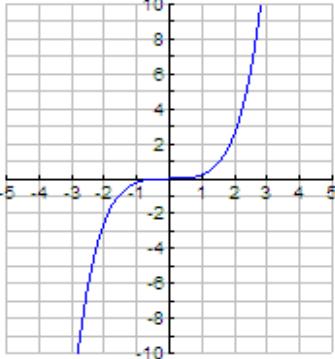
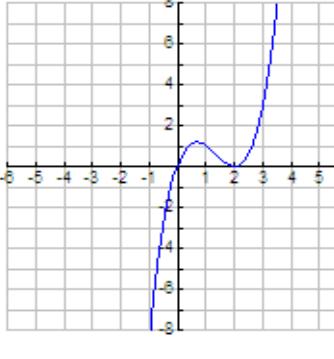
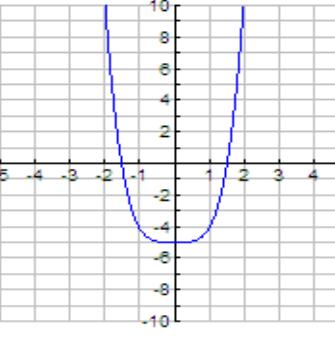
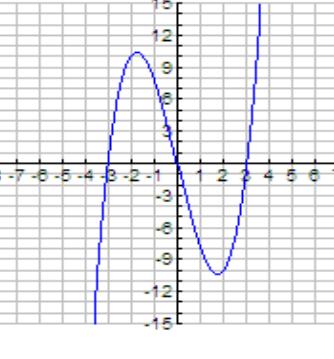
e)  $f(x) = \frac{1}{x^3 - 5}$

2. Decide if these are even or odd or neither from the graph

Functions	Even/Odd/Neither	Functions	Even/Odd/Neither
a) 		e) 	
b) 		f) 	
c) 		g) 	
d) 		h) 	

## Evens and Odds – Practice

Determine whether each of the functions below is even, odd or neither. Justify your answers.

1.		2.	
3.		4.	
5.	$f(x) = 3x^2 + 4$	6.	$f(x) = -2x + 5$
7.	$f(x) = 2x^2 + 3x$	8.	$f(x) = -3x^3 + x$



## Homework Solutions

For each of the following functions, classify each as: even, odd or neither. You must show your work to prove your classification. If you are experiencing difficulty, contact your teacher.

1.

a)

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

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

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

$$f(x) \neq f(-x) \neq -f(x)$$

$\therefore f(x)$  is neither.

d)

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

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

$$-f(x) = -\left(\frac{x}{x^2 - 3}\right) = \frac{-x}{x^2 - 3}$$

$$f(-x) = -f(x)$$

$\therefore f(x)$  is odd.

e)

$$f(x) = \frac{1}{x^3 - 5}$$

$$f(-x) = \frac{1}{(-x)^3 - 5} = \frac{1}{-x^3 - 5}$$

$$-f(x) = -\left(\frac{1}{x^3 - 5}\right) = \frac{-1}{x^3 - 5}$$

$$f(x) \neq f(-x) \neq -f(x)$$

$\therefore f(x)$  is neither.

c)

$$f(x) = \frac{1}{x^2 + 5}$$

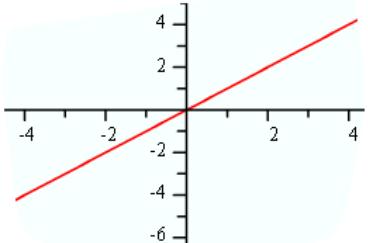
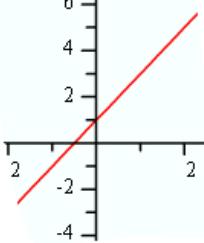
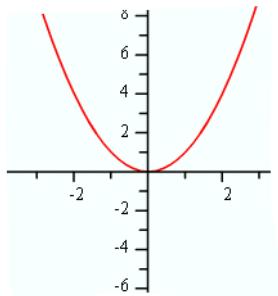
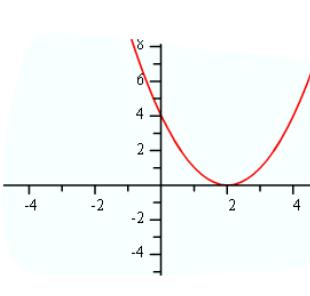
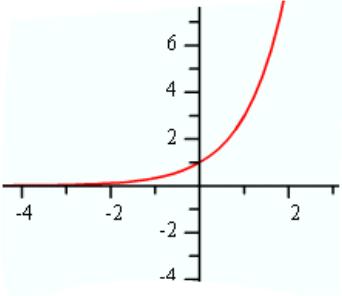
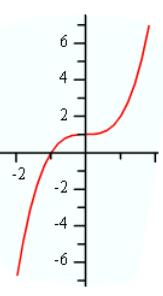
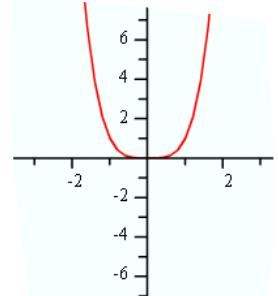
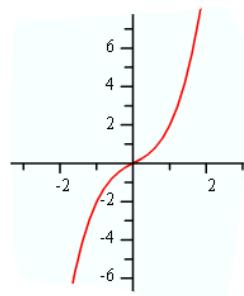
$$f(-x) = \frac{1}{(-x)^2 + 5} = \frac{1}{x^2 + 5}$$

$$-f(x) = -\left(\frac{1}{x^2 + 5}\right) = \frac{-1}{x^2 + 5}$$

$$f(x) = f(-x)$$

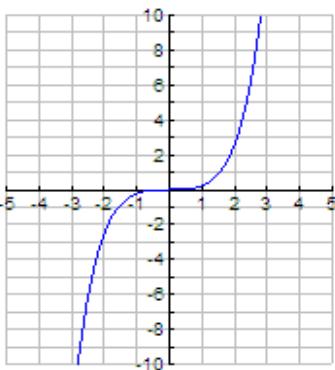
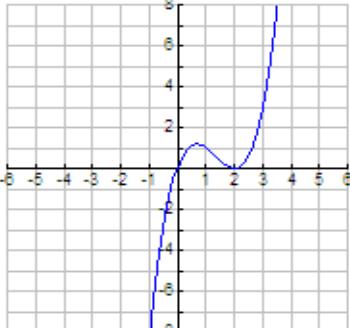
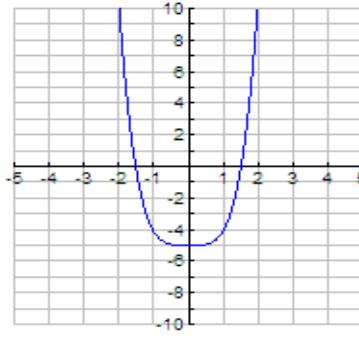
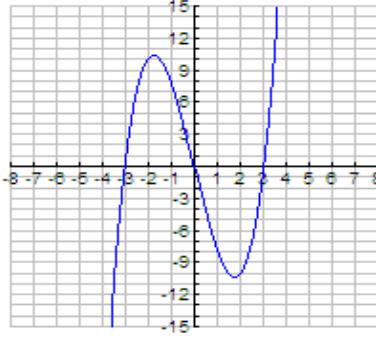
$\therefore f(x)$  is even.

2. Decide if these are even or odd or neither from the graph

Functions	Even/Odd/Neither	Functions	Even/Odd/Neither
a) 	Odd	e) 	Neither
b) 	Even	f) 	Neither
c) 	Neither	g) 	Neither
d) 	Even	h) 	odd

## Evens and Odds – Practice

Determine whether each of the functions below is even, odd or neither. Justify your answers.

1.	odd	 A graph showing a curve that passes through the origin (0,0). For negative x-values, the curve is in the fourth quadrant, approaching the x-axis from above. For positive x-values, the curve is in the second quadrant, approaching the x-axis from below. This indicates an odd function.	2.	neither	 A graph showing a curve that is symmetric about the y-axis (an even function) but also has a sharp cusp or vertical asymptote at x=0, which is not a smooth curve. This indicates a function that is neither even nor odd.
3.	Even	 A graph showing a curve that is symmetric about the y-axis (an even function). It has a local maximum at x=-2 and a local minimum at x=2, both on the x-axis.	4.	Odd	 A graph showing a curve that passes through the origin (0,0). For negative x-values, the curve is in the third quadrant, approaching the x-axis from above. For positive x-values, the curve is in the first quadrant, approaching the x-axis from below. This indicates an odd function.
5.	$f(x) = 3x^2 + 4$	even	6.	$f(x) = -2x + 5$	neither
7.	$f(x) = 2x^2 + 3x$ neither		8.	$f(x) = -3x^3 + x$	odd