

$f(x) = x^2$ $f(1) = 1$
 $f(-1) = 1$
 even

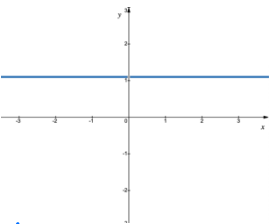
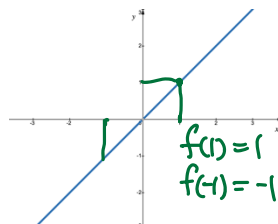
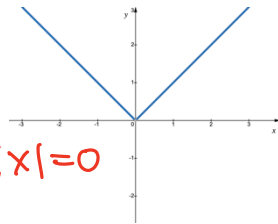
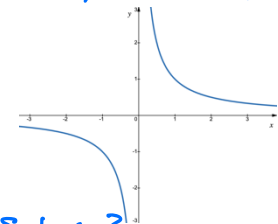
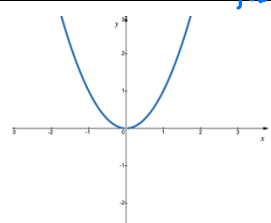
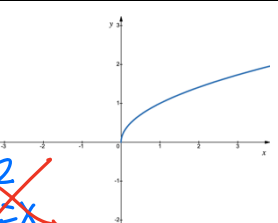
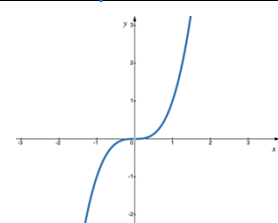
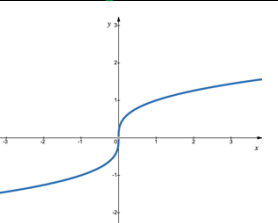
$g(x) = x^3$
 $g(1) = 1$
 $g(-1) = -1$
 hyperbolic function

1. Even Functions and Odd Functions.

Even function: A function f is called even if $f(-a) = f(a)$ for all a .

Odd function: A function f is called odd if $f(-a) = -f(a)$ for all a .

2. Complete the table of basic functions:

$f(x) = 1$ $f(x) = c$ $f(x) = \text{constant function}$  Domain: $(-\infty, \infty)$ Range: $\{1\}$ or $\{c\}$ Odd or Even: Even $f(-a) = f(a)$	$f(x) = x$ linear function  Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$ Odd or Even: Odd $f(-a) = -f(a)$	$f(x) = x $ absolute function  $ x = 0$ Domain: $(-\infty, \infty)$ Range: $[0, \infty)$ Odd or Even: Even $f(-a) = f(a)$	$f(x) = \frac{1}{x}$  $\{x x \neq 0\}$ Domain: $\{x x \in (-\infty, 0) \cup (0, \infty)\}$ Range: $\{y y \in (-\infty, 0) \cup (0, \infty)\}$ Odd or Even: Odd $f(-1) = -1 = -f(1)$
$f(x) = x^2$ parabola function  Domain: $(-\infty, \infty)$ Range: $[0, \infty)$ Odd or Even: Even	$f(x) = \sqrt{x}$  $y = x$ Domain: $[0, \infty)$ Range: $[0, \infty)$ Odd or Even: Neither Neither ✓	$f(x) = x^3$  Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$ Odd or Even: Odd	$f(x) = \sqrt[3]{x}$  Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$ Odd or Even: Odd

3. Determine which of the following functions are even, odd, or neither.

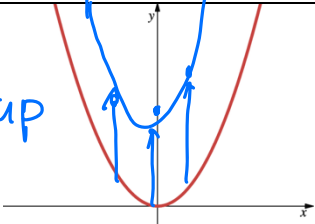
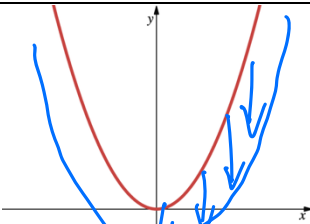
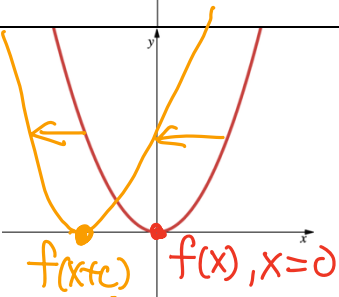
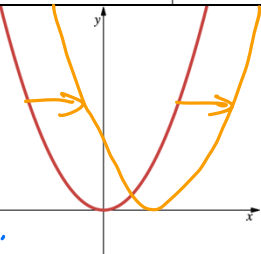
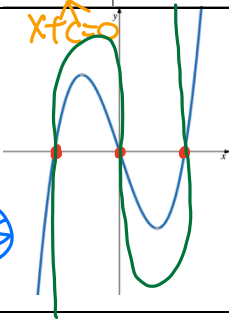
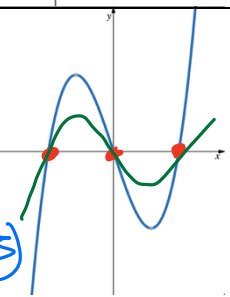
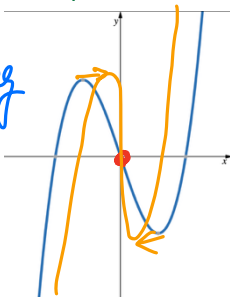
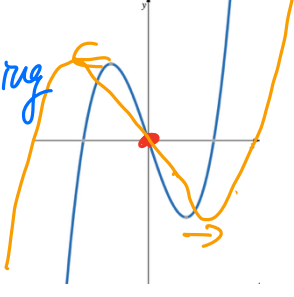
(a) $f(x) = 2x^2 + x^4$ (b) $f(x) = x + 3x^3$ (c) $f(x) = x^3 + 4x^2$

(a) $f(a) = 2(a)^2 + (a)^4$
 $= 2a^2 + a^4$
 $f(-a) = 2(-a)^2 + (-a)^4$
 $= 2a^2 + a^4$
 $f(-a) = f(a) \Rightarrow$ Even function.

(b) $f(a) = a + 3a^3$
 $f(-a) = (-a) + 3(-a)^3$
 $= -a - 3a^3$
 $-f(a) = -(a + 3a^3)$
 $= -a - 3a^3$
 $f(-a) = -f(a)$
 odd function

(c) $f(a) = a^3 + 4a^2$
 $f(-a) = -a^3 + 4(-a)^2$
 $= -a^3 + 4a^2$
 $-f(a) = -(a^3 + 4a^2)$
 $= -a^3 - 4a^2$
 neither

4. Complete the table

Transformation of $f(x)$	Given $f(x)$ and then draw the transformation	
<u>Vertical shifts</u> $y = f(x) + c$ add / subtract a constant on output	$c > 0$: shift up 	$c < 0$: shift down 
<u>Horizontal shifts</u> $y = f(x + c)$ add / subtract a constant on input	$c > 0$: shift to the left 	$c < 0$: shift to the right. 
<u>Vertical Stretching/shrinking</u> $y = cf(x)$ Multiply a constant on output	$c > 1$: Stretching vertically (fixed x-intercepts) 	$0 < c < 1$: Shrinking vertically (fixed x-intercepts) 
<u>horizontal Stretching/shrinking</u> $y = f(cx)$	$c > 1$: shrinking 	$0 < c < 1$: Stretching 

<u>Reflection about x-axis</u> $y = -f(x)$	<u>Reflection about y-axis</u> $y = f(-x)$
