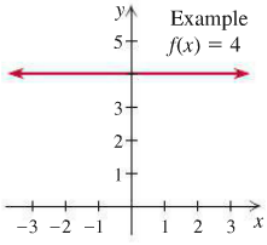
Writing Project #1 - Graphing by Transforming Basic Function Graphs

Survey of Basic Functions

Constant Function $f(x) = k$

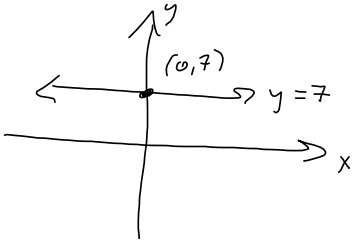


Domain $(-\infty, \infty)$
Range {4}
Constant on $(-\infty, \infty)$
Symmetric about y-axis

$f(x) = 7$

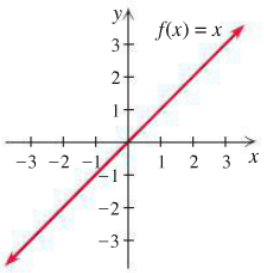
$y = 7$

Horizontal Line



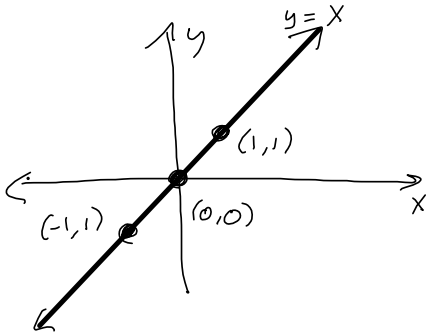
Vertical lines aren't functions.

Identity Function



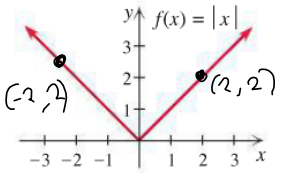
Domain $(-\infty, \infty)$
Range $(-\infty, \infty)$
Increasing on $(-\infty, \infty)$
Symmetric about origin

$y = x$



Signed
$y = m(x - x_1) + y_1$
is the form of point-slope we want for this portion of the class.

Absolute Value Function

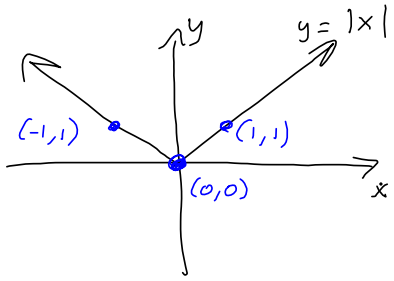


Domain $(-\infty, \infty)$
Range $[0, \infty)$
Increasing on $[0, \infty)$
Decreasing on $(-\infty, 0]$
Symmetric about y-axis

$$f(x) = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

$f(-2) = 2 = -(-2)$

$|-2| = 2$



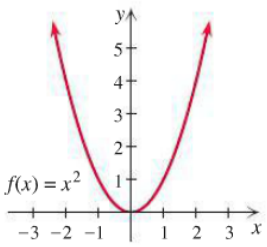
EVEN function

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

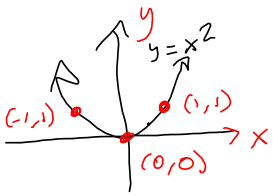
$f(-x) \rightarrow |-2| = 2$

$f(x) \rightarrow |2| = 2$

Square Function



Domain $(-\infty, \infty)$
Range $[0, \infty)$
Increasing on $[0, \infty)$
Decreasing on $(-\infty, 0]$
Symmetric about y-axis



Even :

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

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

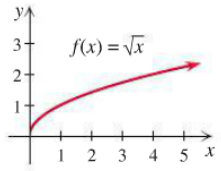
$= ((-1)(x))^2$

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

$= 1 \, x^2$

$= x^2 = f(x)$

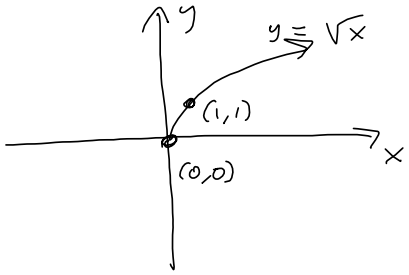
Square-Root Function



Domain $[0, \infty)$
Range $[0, \infty)$
Increasing on $[0, \infty)$ = its domain

"Increasing on its domain."

Domain:
Need $x \geq 0$
Results in
$y \geq 0$

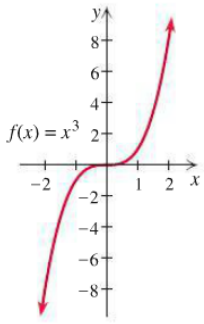


This covers

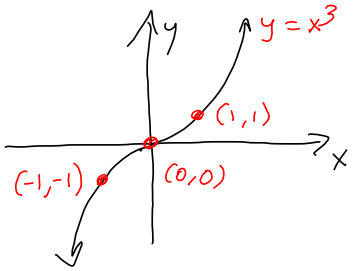
$\sqrt[4]{x}, \sqrt[6]{x}, \ldots, \sqrt[2n]{x}, \ldots$

$x^{\frac{1}{4}}, x^{\frac{1}{6}}, \ldots, x^{\frac{1}{2n}}, \ldots$

Cube Function

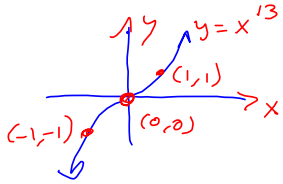


Domain $(-\infty, \infty)$
Range $(-\infty, \infty)$
Increasing on $(-\infty, \infty)$
Symmetric about origin



This covers:

$x^5, x^7, \ldots, x^{2n+1}, \ldots$



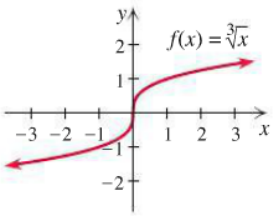
ODD:

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

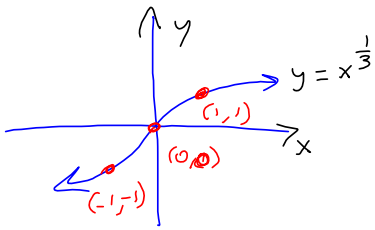
$f(-2) = (-2)^3 = ((-1)(2))^3 = (-1)^3(2)^3 = -1 \cdot 2^3 = -2^3$

$= -(2^3) = -f(2)$

Cube-Root Function



Domain $(-\infty, \infty)$
Range $(-\infty, \infty)$
Increasing on $(-\infty, \infty)$
Symmetric about origin

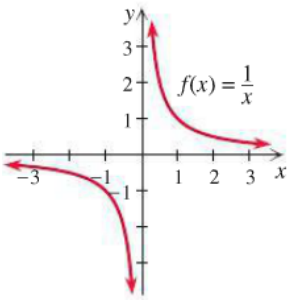


Covers:

$x^{\frac{1}{5}}, x^{\frac{1}{7}}, \ldots, x^{\frac{1}{2n+1}}$

$\sqrt[5]{x}, \sqrt[7]{x}, \ldots$

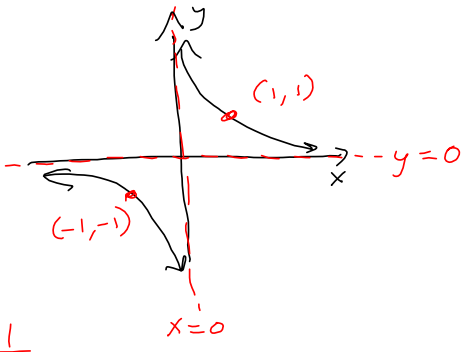
Reciprocal Function



$\frac{1}{100000000} \neq 0$

horizontal asymptote $y = 0$

ODD Func.



Covers $\frac{1}{x^3}, \frac{1}{x^5}, \ldots, \frac{1}{x^{2n+1}}, \ldots$

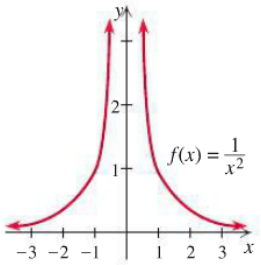
Domain $(-\infty, 0) \cup (0, \infty)$

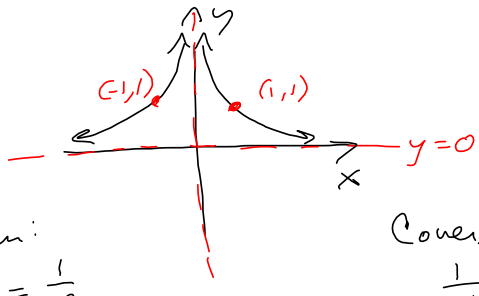
Range $(-\infty, 0) \cup (0, \infty)$

Decreasing on $(-\infty, 0) \cup (0, \infty)$ (on its entire domain, i.e.)

Symmetric about origin

"Reciprocal-Squared" Function





Even:

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

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

Covers

$\frac{1}{x^4}, \frac{1}{x^6}, \ldots, \frac{1}{x^{2n}}$

Domain $(-\infty, 0) \cup (0, \infty)$

Range $(0, \infty)$

Increasing on $(-\infty, 0)$

Decreasing on $(0, \infty)$

Symmetric about y-axis.