

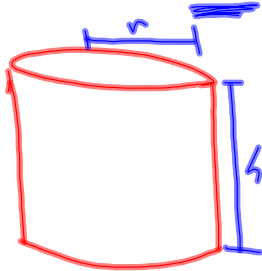
Finding a formula for a described function

Example:

A store has been selling 200 DVD burners a week at \$115 each. A market survey indicates that for each \$10 rebate offered to buyers, the number of units sold will increase by 20 a week. Express the revenue generated from DVD burner sales as a function of the number of weeks after the rebates begin.

Example:

An oil can in the shape of a cylinder is to have a volume of 400 cm^3 . Material for the top and bottom of the can will cost $\$6/\text{cm}^2$ and the lateral sides will cost $\$4/\text{cm}^2$ to construct. Express the cost of materials to construct the can as a function of the radius of the can.



$V = \pi r^2 h$

$400 = \pi r^2 h$

$h = \frac{400}{\pi r^2}$

Top & Bottom

$\$6/\text{cm}^2$

Lateral Sides

$A = 2\pi r h$

$2\pi r$

$\$4/\text{cm}^2$

$(\text{Cost} = 6(2\pi r^2) + 4(2\pi r h))$

$(\text{Cost} = 12\pi r^2 + 8\pi r h)$

$C(r) = 12\pi r^2 + 8\pi r \left(\frac{400}{\pi r^2}\right)$

$C(r) = 12\pi r^2 + 3200$

Functions continued...

1. Determine the equation that describes each of the following:

(a)

$y - y_1 = m(x - x_1)$
 $y - 0 = -\frac{1}{2}(x - 3)$
 $y = -\frac{1}{2}x + \frac{3}{2}$
 $y = mx + b$
 $m = -\frac{1}{2}$
 $b = \frac{3}{2}$
 Standard: $Ax + By + C = 0$
 $x + 2y - 3 = 0$

(b)

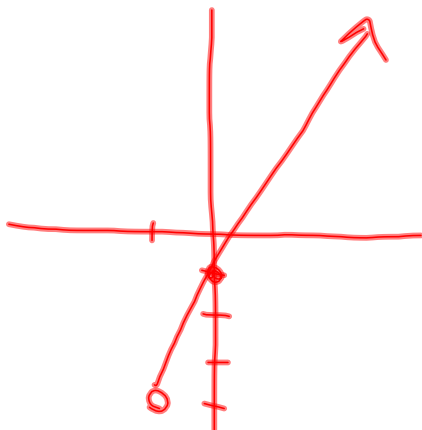
$y = a(x - h)^2 + k$
 $-1 = a(0 - 1)^2 - 4$
 $3 = a$
 $y = 3(x - 1)^2 - 4$

2. Sketch each of the following:

(a) $f(x) = 3x - 1, x > -1, x \in R$

x -Int. y -Int.
 $0 = 3x - 1$ $y = 3(0) - 1$
 $\frac{1}{3} = x$ $y = -1$
 Boundary

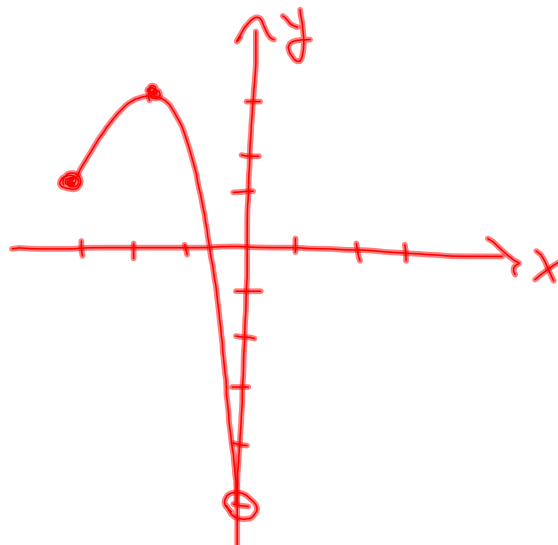
x	y
-1	-4
0	-1



(b) $f(x) = -2(x + 2)^2 + 3, -3 \leq x < 0, x \in R$

$V(-2, 3)$

x	y
-3	1
0	-5

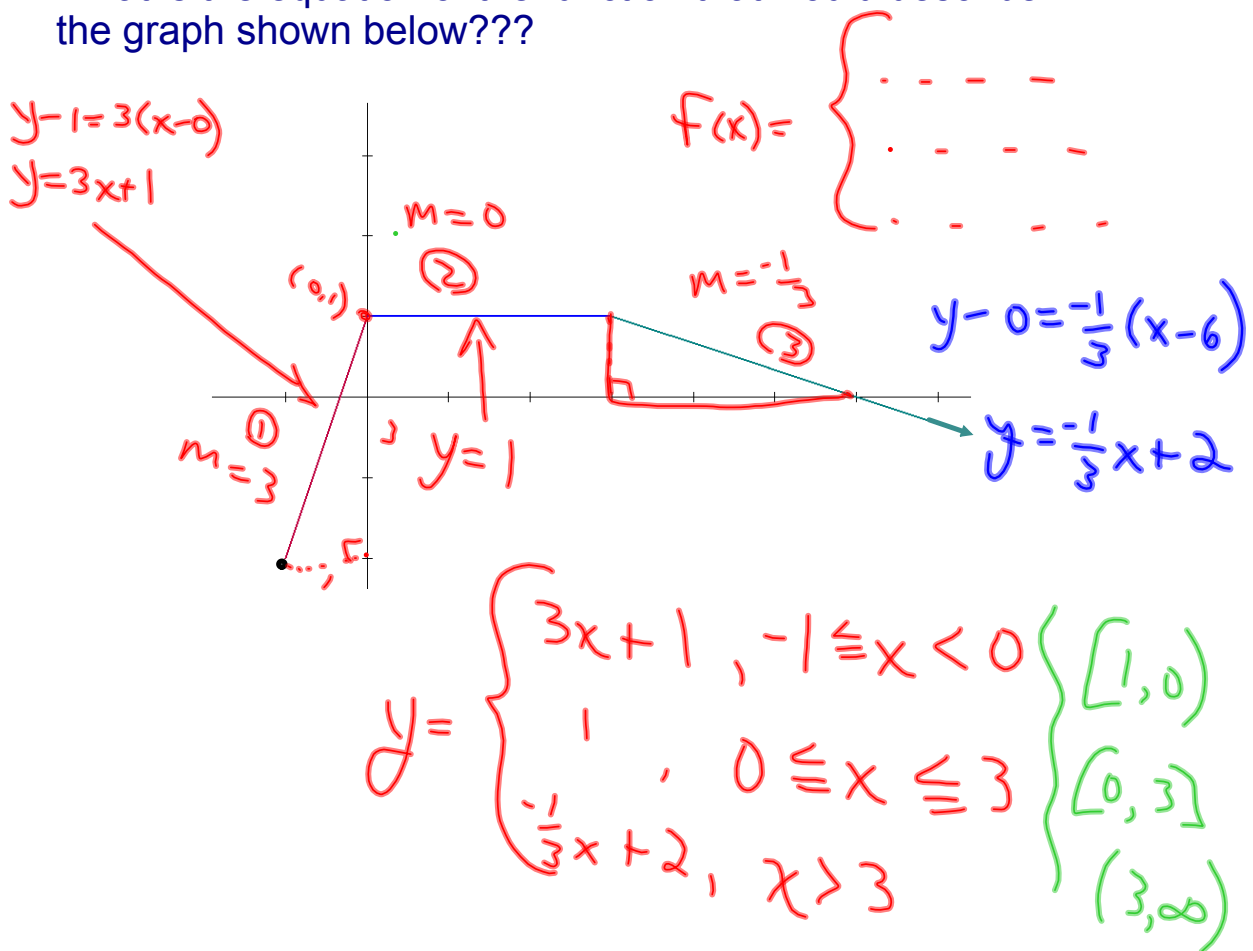


Quick Review of Functions

- What is a function?
- Domain and Range-----> Remember to look at restrictions on functions
- Function Notation
- How to check for a function (Table and Graph)

Let's head into a new direction...

What is the equation of the function that would describe the graph shown below???



Piecewise Defined Functions

Definition:

- Functions defined by different formulas in different parts of their domains

Example:

$$f(x) = \begin{cases} x + 3 & \text{if } x \leq 2 \\ x^2 - 2 & \text{if } x > 2 \end{cases}$$

↖ (0, -2)

- 1) Determine $f(1)$, $f(3)$, and $f(2)$.
- 2) Sketch $f(x)$.

1) $f(1) = 1 + 3 = 4$ $f(3) = (3)^2 - 2 = 7$ $f(2) = 2 + 3 = 5$

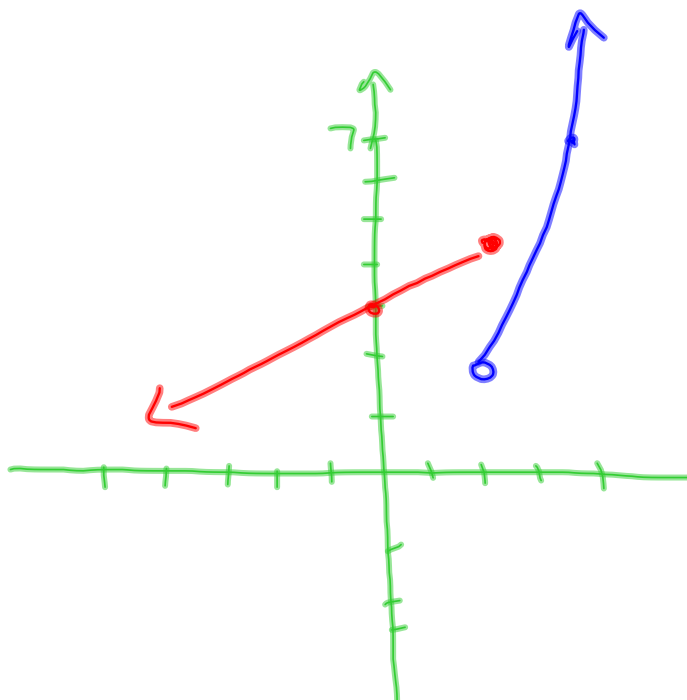
$x \leq 2$
 $y = x + 3$

x	y
2	5
0	3

$y = x^2 - 2$ $x > 2$

x	y
2	2
3	7

Vertex (0, -2)
 ↖ can't see



Sketch the following piecewise function:

$$f(x) = \begin{cases} \frac{1}{2}x - 2 & \text{if } x < -2 \\ -1 & \text{if } -2 \leq x \leq 1 \\ (x-2)^2 + 1 & \text{if } x > 1 \end{cases}$$

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

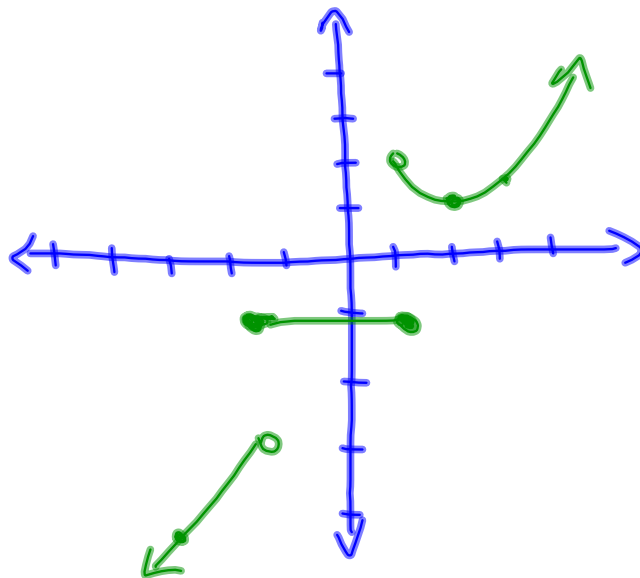
x	y
-2	-3
-4	-4

$$y = -1$$

x	y
-2	-1
1	-1

$$V(2, 1)$$

x	y
1	2



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$$\text{Revenue: } \left(\text{DVD Burners Sold} \right) \left(\text{Selling Price} \right)$$

Let "n" Rep. # of weeks after Rebate offered

$$R(n) = (200 + 20n)(115 - 10n)$$

Example:

An oil can in the shape of a cylinder is to have a volume of 400 cm^3 . Material for the top and bottom of the can will cost $\$6/\text{cm}^2$ and the lateral sides will cost $\$4/\text{cm}^2$ to construct. Express the cost of materials to construct the can as a function of the radius of the can.

$V = \pi r^2 h$
 $\frac{400}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2}$
 $h = \frac{400}{\pi r^2}$

Cost = $2\pi r^2(6) + (2\pi r h)(4)$
 Cost = $12\pi r^2 + 8\pi r h$

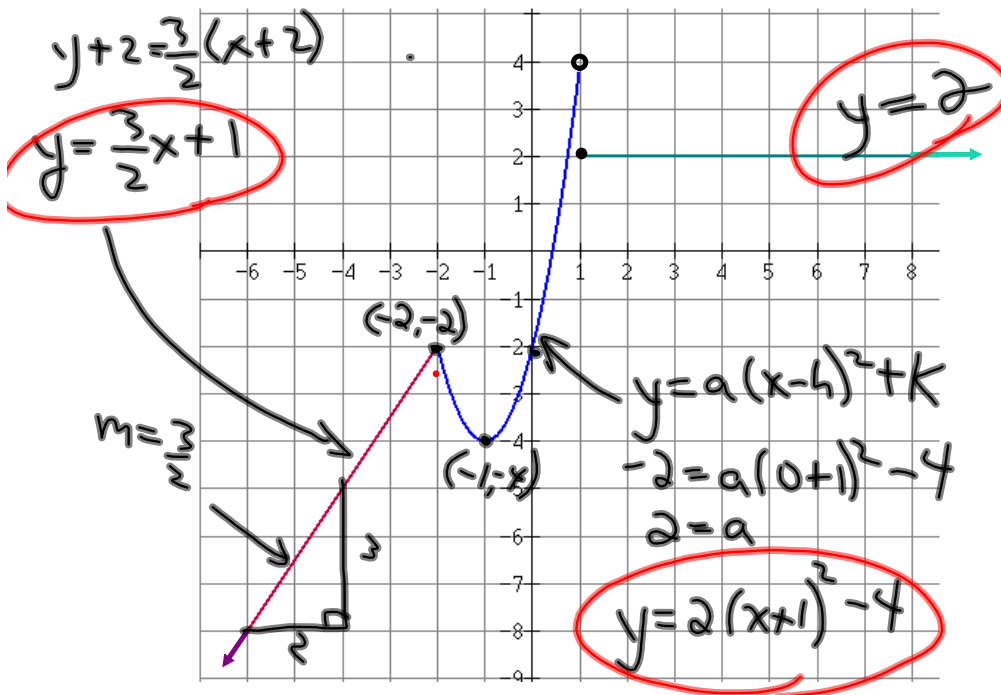
$C(r) = 12\pi r^2 + 8\pi r \left(\frac{400}{\pi r^2} \right)$
 $C(r) = 12\pi r^2 + \frac{3200}{r}$

Warm Up

Determine the equation of a piecewise function to describe the graph below...

Must remember how to find the equation of a line \longrightarrow "POINT-SLOPE FORMULA"

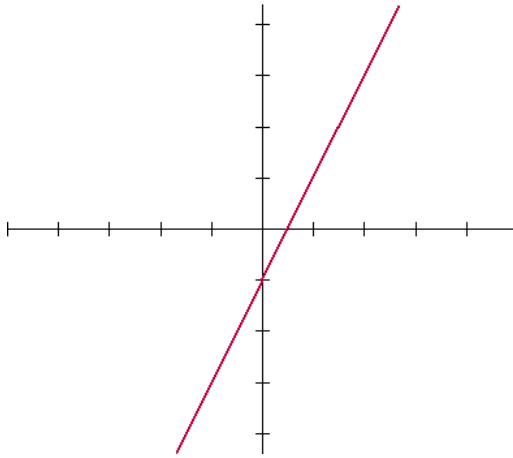
$$y - y_1 = m(x - x_1)$$



$$f(x) = \begin{cases} \frac{3}{2}x + 1, & x < -2 \\ 2(x+1)^2 - 4, & -2 \leq x < 1 \\ 2, & x \geq 1 \end{cases}$$

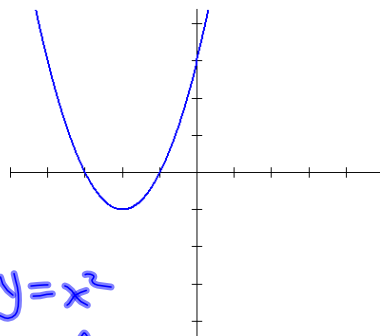
Catalog of Essential Functions

1. Linear

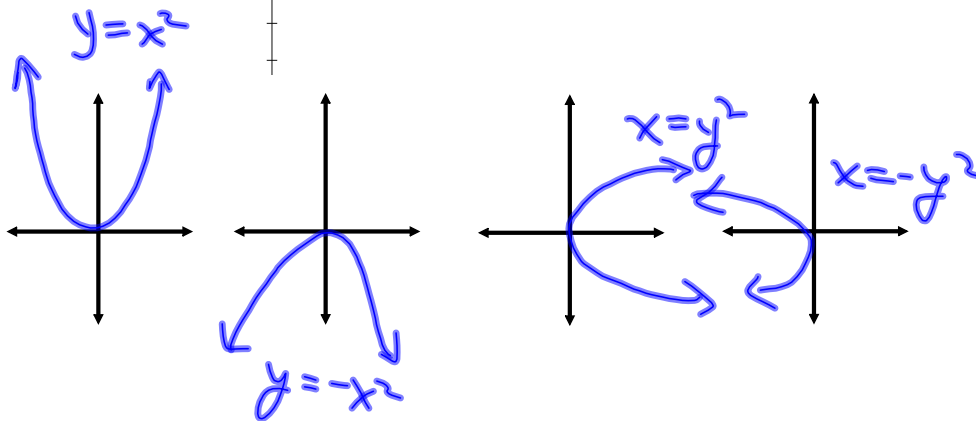


- Straight line
- Equation will be degree one
- Should be able to identify *slope*, *intercepts*, and *equation* from the graph

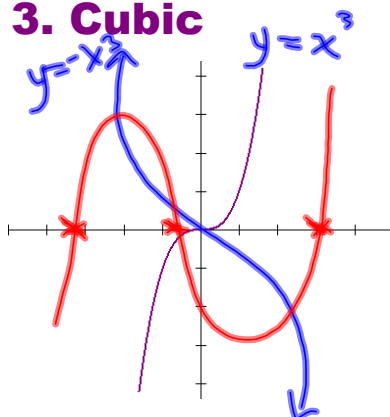
2. Quadratic



- Parabola (U-Shaped)
- Either x or y will be squared (Not both!)
- Should know the 4 basic quadratic functions
- Should be able to apply transformations to the basic quadratic functions



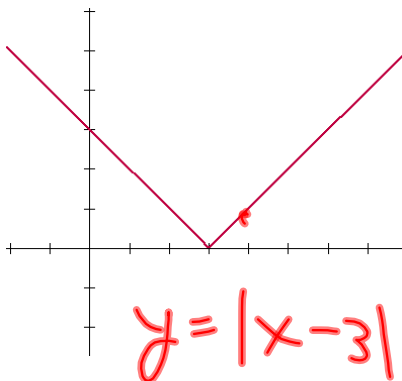
3. Cubic



- S-Shaped
- Will work with functions having raised to the third power
- Should be able to apply transformations to the basic quadratic functions

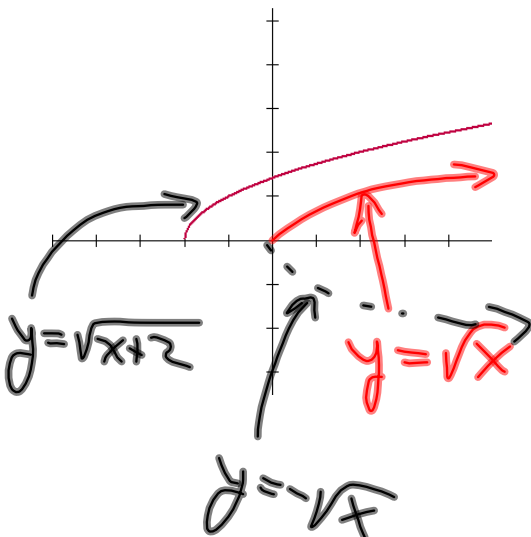
4. Absolute Value

(Linear)



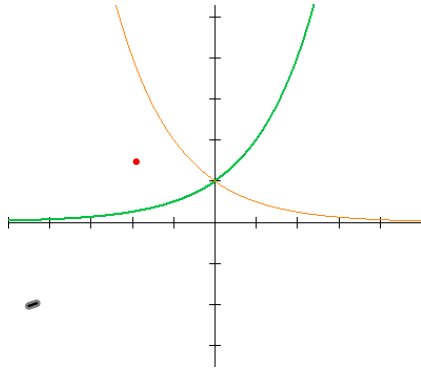
- V-Shaped
- Equation will have a variable within the absolute value bars
- Should be able to apply transformations to the basic absolute value functions

5. Square Root



- Half parabola
- Equation will have a variable under the square root sign
- Should be able to apply transformations to the basic square root function

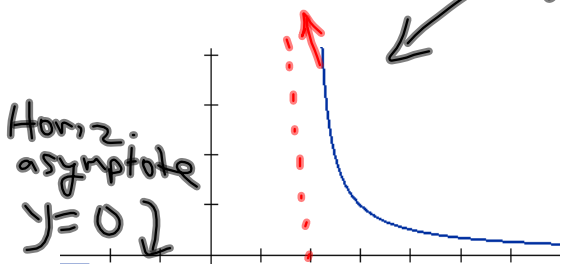
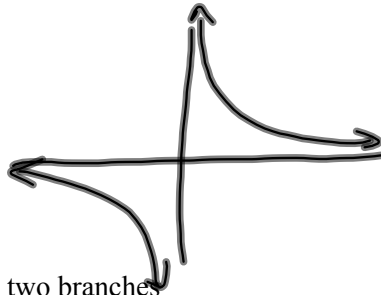
6. Exponential



- Steadily increasing or decreasing
- Base will be a number and variable will appear in the exponent
- Should be able to identify the horizontal asymptote

7. Reciprocal

$$y = \frac{1}{x}$$



- Will have two branches
- Equation will have a variable within denominator of a rational expression
- Be able to identify the vertical and horizontal asymptotes

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

Vertical asymptote

