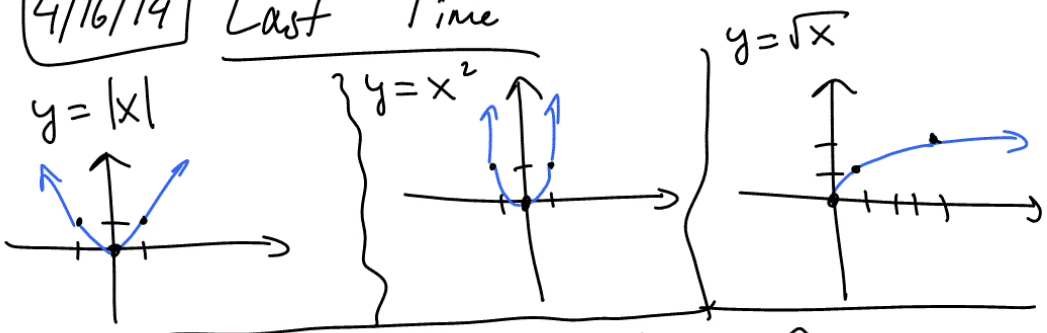
4/16/14 Last Time

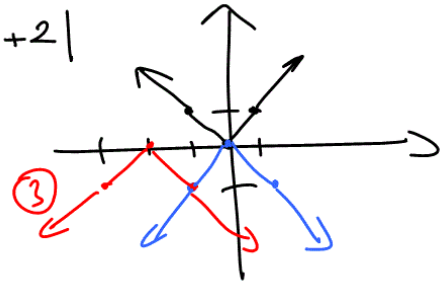


Graph: $f(x) = -|x+2|$

① $y = |x|$

② $y = -|x|$ reflect to x-axis

③ $y = -|x+2|$ ←



10.3 Graphing Piecewise-defined functions and shifting and Reflecting Graphs of Functions

$$f(x) = \begin{cases} x+2, & \text{if } x < -1 \\ -3x-2, & \text{if } x \geq -1 \end{cases}$$

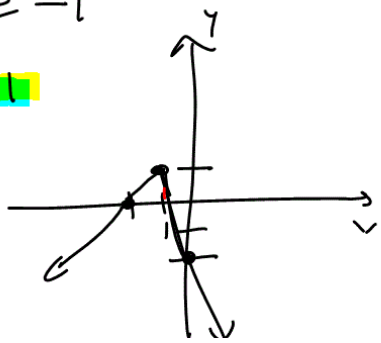
Graph

$y = x+2$, if $x < -1$

x	y
-1	1
-2	0

$y = -3x-2$, if $x \geq -1$

x	y
-1	1
0	-2



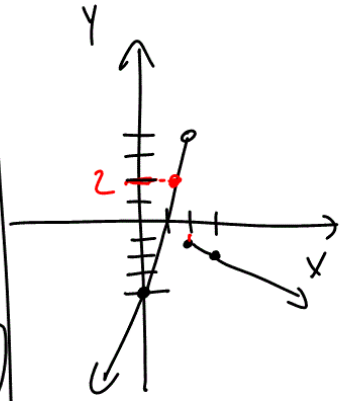
Graph: $g(x) = \begin{cases} 4x-4 & \text{if } x < 2 \\ -x+1 & \text{if } x \geq 2 \end{cases}$

$y = 4x-4$ if $x < 2$

x	y
2	4
0	-4

$y = -x+1$, if $x \geq 2$

x	y
2	-1
3	-2



(a) find $g(-4) = 4(-4)-4 = \boxed{-20}$ ($x = -4 < 2$)

(b) find $g(2) = -2+1 = \boxed{-1}$ ($x = 2$)

(c) find x if $g(x) = 2$, $y = 2$, $x = ?$

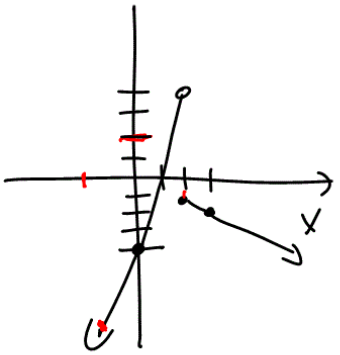
$2 = 4x-4$

$+4 \quad +4$

$6 = 4x$

$\frac{6}{4} = \frac{4x}{4}$

$\boxed{\frac{3}{2}} = x$



(d) find domain $(-\infty, \infty)$

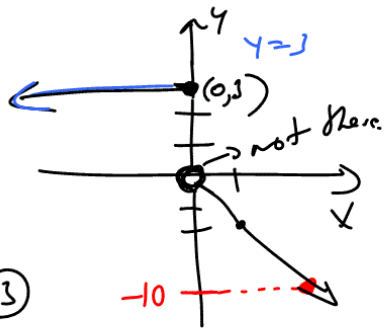
(e) range = ? $(-\infty, 4)$

$$h(x) = \begin{cases} 3 & \text{if } x \le 0 \\ -2x & \text{if } x > 0 \end{cases}$$

$y = 3, x \le 0$ | $y = -2x, x > 0$

x	y
0	3
-1	3

x	y
0	0
1	-2



⑥ find $h(0) = 3$

⑦ find $h(-7) = 3$

⑧ find x if $h(x) = -10$ | $x = 0$, find $y = 3$

$x = ?$ $y = -10$

$\frac{-10}{-2} = \frac{-2x}{-2}$

$x = 5$

#43 Graph using transformations.

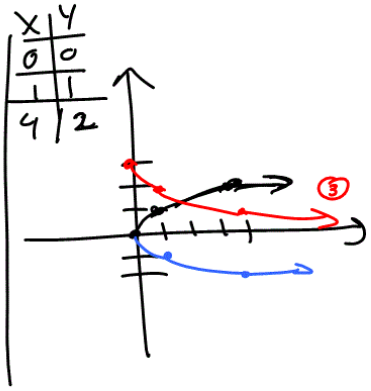
$$h(x) = -\sqrt{x} + 3$$

x	y
0	0
1	1
4	2

① $y = \sqrt{x}$

② $y = -\sqrt{x}$ reflect to x-axis

③ $y = -\sqrt{x} + 3$ ↑



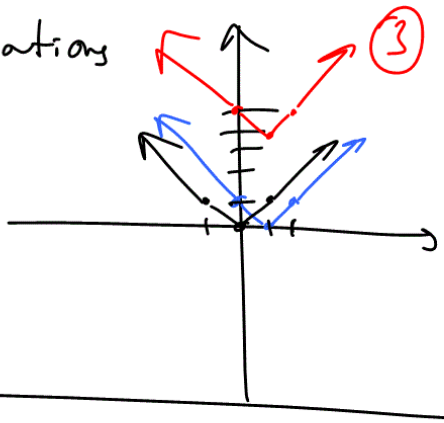
(Ex) Graph using transformations

$g(x) = |x-1| + 4$

① $y = |x|$

② $y = |x-1|$ →

③ $y = |x-1| + 4$ ↑



(10.4) Variation and Problem Solving

Direct Variation

y varies directly as x or y is directly proportional to x if

$y = kx$

k = number : constant of variation

(Ex) $y = 3x$, $k = 3$

(#6) If y varies directly as x, find the constant of variation and the direct variation formula.

$y = 11$ when $x = \frac{1}{3}$

$y = kx$

$3 \cdot 11 = k \cdot \frac{1}{3} \cdot 3$

$33 = k$

$y = 33x$

(12) Charles's Law states: If pressure P stays the same, the volume V is directly proportional to temperature T. If a balloon is filled with 20 cubic meters of gas at a temperature of 300 K, find the new volume if the temperature rises to 360 K while the pressure stays the same.

$V = kT$

if $V = 20$, $T = 300$

$\frac{20}{300} = \frac{k \cdot 300}{300}$

$\frac{1}{15} = k$

equation: $V = \frac{1}{15} \cdot T$

$T = 360, V = ?$

$V = \frac{1}{15} \cdot 360 = \frac{360}{15} = 24\ m^3$

Inverse Variation:

y varies inversely as x or y is inversely proportional to x if $y = \frac{k}{x}$

k = constant of variation

(#19) y varies inversely as x, find the equation of variation. If $y = 0.2$, $x = 0.7$

$(0.7)\ 0.2 = \frac{k}{0.7}\ (0.7)$

$0.14 = k$

$y = \frac{0.14}{x}$

#25 The intensity of light varies inversely as the square of the distance from the light source. If the distance is doubles, determine what happens to the intensity.

the distance changes from 12 m. to 24 m
What happens to intensity?

intensity $= I$, distance $= D$

$$I = \frac{K}{D^2}$$

$D = 12$, $I = \frac{K}{144}$, if $D = 24$, $I = \frac{K}{576}$

will continue later...

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23 If the voltage V on a circuit is held constant the current I is inversely proportional to the resistance R. If the current is 40 ampers when resistance is 270 ohms, find the current when the resistance is 150 ohms.

$$I = \frac{K}{R}$$

$I = 40$, $R = 270$, $270 \cdot 40 = \frac{K}{270} \cdot 270$

$10{,}800 = K$

$$I = \frac{19800}{R} = \frac{10,800}{150} = 72 \text{ amps}$$

$R = 150, I = ?$

Joint Variation:

If the ratio of y to the product of 2 or more variables is constant then we say y varies jointly as the other variables.

examples: (1) y varies jointly as x and z

$$y = k \cdot x \cdot z$$

(2) y varies directly as x and inversely as z

$$y = \frac{k \cdot x}{z}$$

(3) y varies directly as square root of x and inversely as cube of t

$$y = \frac{k\sqrt{x}}{t^3}$$

$$y = k \cdot \frac{\sqrt{x}}{t^3}$$

#40 The number of cars varies jointly as the number of workers and the time they work. If 200 workers can produce 60 cars in 2 hours, find how many cars 240 workers should be able to make in 3 hours.

C = # of cars, w = # of workers, t = time

$$C = kwt$$

$w = 200$, $C = 60$, $t = 2$

$$\frac{60}{200 \cdot 2} = \frac{k \cdot 200 \cdot 2}{200 \cdot 2}$$

$$\frac{3}{20} = k$$

$$C = \frac{3}{20} \cdot w \cdot t$$

$C = ?$, $w = 240$, $t = 3$

$$C = \frac{3}{20} \cdot \frac{12}{240} \cdot 3 = 108 \text{ cars}$$