Wed. wk 1 ——————————————————————————

Functions:
   Domain: set of allowable inputs ↗ can't do
   Range: All achievable outputs

1. divide by 0
2. sqrt of a negative (even)
3. can't log a negative

Transformations
_____
given $f(x)$, if $g(x) = f(kx)$ ————————┐

affects
y-values
b/c k is
outside
$\begin{cases} g(x) = k\,f(x) \\ \\ g(x) = f(x) + k \end{cases}$

$g(x) = f(x+k)$ ————————

→ change x-values
(domain)
where f occurs

How do transformations affect domain / range?

given
$y = f(x)$, domain = $[-5, 10)$ ⟹ whatever is inside parenthesis is in $[-5, 10)$
range = $[20, 40]$

if
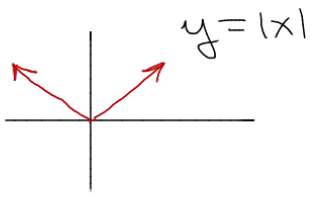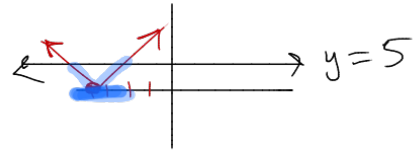 $g(x) = f(6x)$, then its domain = $\underset{\longleftarrow}{\quad}$

$6x \in [-5, 10) \Rightarrow x \in \left[-\frac{5}{6}, \frac{10}{6}\right)$

   range = $[20, 40]$

Abs. Value Inequalities ——————————————

$y = |x|$

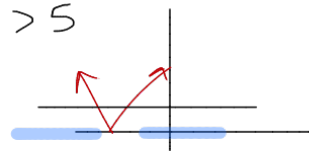$f(x) = |x+4|$

$y = 5$

So $|x+4| < 5$

think both sides are y-values
of graph (heights)

$\Rightarrow -5 < x+4 < 5$ "and"
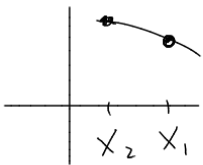
(vs) $|x+4| > 5$

"or"

$x+4 > 5$ or $x+4 < -5$

Functions: (Increasing & Decreasing)

$f(x)$ is INC on (a,b) if
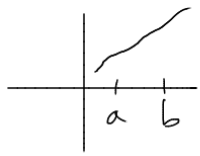
"$<$"   "$<$"
if $x_1 > x_2$ then $f(x_1) > f(x_2)$
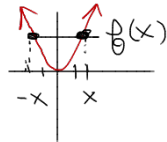   preserve order
for all $x_i \in (a,b)$

$f(x)$ is DEC

if $x_1 > x_2$, $f(x_1) < f(x_2)$
            reverses order
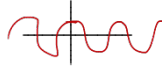for all $x_i \in (a,b)$

Even / ODD Functions ──────────────────────

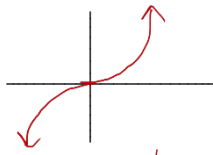<u>gist</u>   <u>def'n</u>

Even: $f(-x) = f(x)$

Symmetry
about
y-axis   EX. $f(x) = \cos(x)$, $\cos(175°) = \cos(-175°)$
                     (Even)

Odd   EX $f(x) = \sin(x)$, $\sin(-175°) = -\sin(175°)$

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

Symmetry under 180° rotation
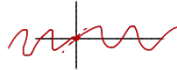
Lines

$$y - y_1 = m(x - x_1)$$ (point – slope) <---

$$y = mx + b$$ (slope – intercept)
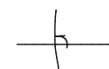
$$\frac{y - y_1}{x - x_1} = m$$ slope   get from

same
slope

parallel   //

negative
reciprocal

perpendicular   ⊥

EX   given   slope & point, find   an   equation   of   corresp. line.
  5   (1,3) $\boxed{y - 3 = 5(x - 1)}$

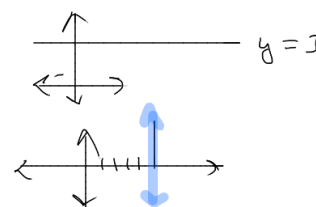EX   Find   line   b/w   (7, 10)   and   (-1, 12)
① Find slope: $\dfrac{10 - 12}{7 - (-1)} = \dfrac{-2}{8} = -\dfrac{1}{4}$

② $y - 10 = -\dfrac{1}{4}(x - 7)$ (or) $y - 12 = -\dfrac{1}{4}(x + 1)$

EX Find   line   perp. to $y = 7x + 3$ that   contains   (0,1)
  ① get slope: $m = -\dfrac{1}{7}$ ② $y - 1 = -\dfrac{1}{7}(x - 0)$ = $\boxed{y = -\dfrac{1}{7}x + 1}$

EX $y = 3$ is   eq'n of   a   horiz line $y = 3$
  $x = 5$ is   "   "   "   vertical
                                line

Review of Function Composition / Simplification ——————

Let $f(x) = \frac{1}{x}$ Simplify $\dfrac{f(x+h) - f(x)}{h}$

$f(5) = \frac{1}{5}$

$f(2+3) = \frac{1}{2+3}$

$f(x+h) =$

$$= \dfrac{\dfrac{1}{x+h} - \dfrac{1}{x}}{h}$$

common denom.

$$= \dfrac{\dfrac{x}{x}\left(\dfrac{1}{x+h}\right) - \dfrac{x+h}{x+h}\left(\dfrac{1}{x}\right)}{h}$$

$$= \dfrac{\dfrac{x - (x+h)}{x(x+h)}}{h} = \left[\dfrac{\dfrac{-h}{x(x+h)}}{h}\right] = \left[\dfrac{-h}{x(x+h)}\right] \cdot \dfrac{1}{h}$$

$$= \dfrac{-1}{x(x+h)}$$