Parent function – basics
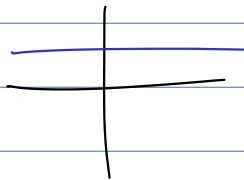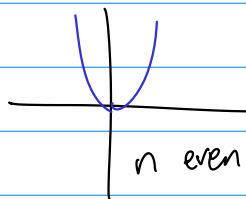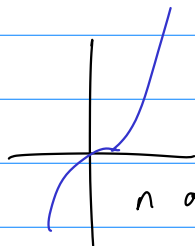
Constant
$f(x) = c$
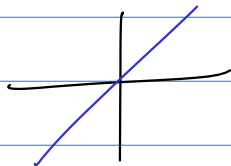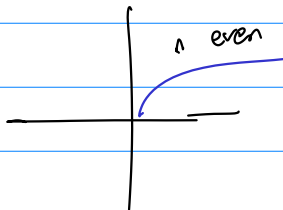
Identity
$f(x) = x$
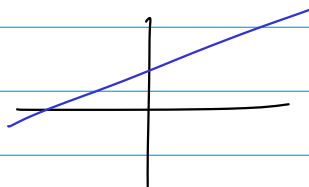
Linear
$f(x) = mx + b$

Power
n even   n odd
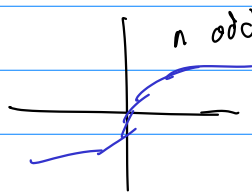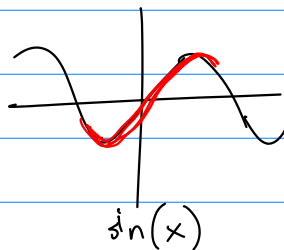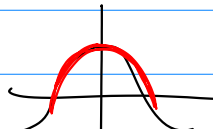
$f(x) = x^n$

Root
n even   n odd

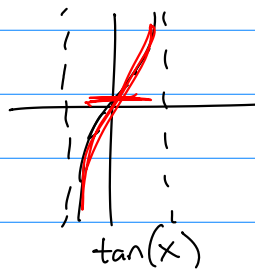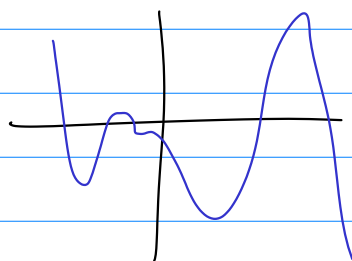$f(x) = \sqrt[n]{x} = x^{1/n}$

Trig
$\sin(x)$ $\cos(x)$ $\tan(x)$

General Polynomials

n (degree) = largest exponent

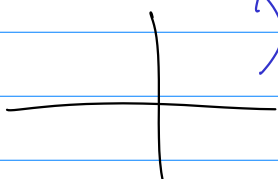$f(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \ldots a_{n-1} x^{n-1} + a_n x^n$

Constants   etc.

General Rational functions
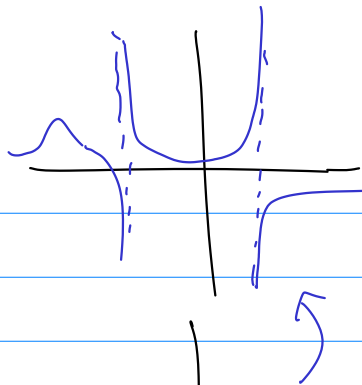
$$f(x) = \frac{P(x)}{Q(x)} \quad \leftleftarrows \text{poly's}$$

Algebraic functions

$$f(x) = \frac{+, -, *, \div}{\text{powers, roots}}$$

Ex: $f(x) = \frac{\sqrt{3 + x^2}}{9 - x^8}$

Reciprocal
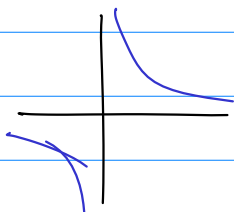
$$f(x) = \frac{1}{x}$$

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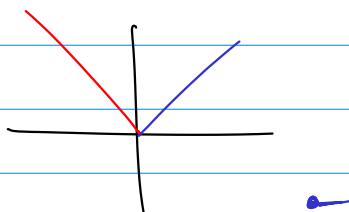
$$f(x) = |x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

Greatest Integer function
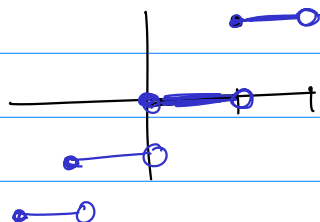
$$f(x) = [\![x]\!] = \lfloor x \rfloor = \text{Rounded down}^{x,}$$
$$= \text{The greatest integer} \leq x.$$

To transform f(x)...	Find
Vertically c units up	$f(x) + c$
down	$f(x) - c$
Horizontally c units right	$f(x - c)$
left	$f(x + c)$
Stretch vertically by a factor of c	$c \cdot f(x)$
Reflect over x-axis	$-f(x)$
Stretch horizontally by a factor of c	$f\left(\frac{x}{c}\right)$

Reflect over y-axis $\qquad$ $f(-x)$

Pg 42 #3

$f(x)$

a. ③
b. ①
c. ④
d. ⑤
e. ②

#6: • Vert stretch by 2
$\quad$ • 2 units right

$$f(x) = \sqrt{3x - x^2}$$

Vert stretch $\searrow$

$$f(x) = 2\sqrt{3x - x^2}$$

2 units right $\searrow$

$$f(x) = 2\sqrt{3(x-2) - (x-2)^2} \quad ✓$$

#7

* Reflect over x-axis
* 1 unit down
* 4 units left

$$f(x) = \sqrt{3x - x^2}$$

Refl x-axis $\searrow$

$$f(x) = -\sqrt{3x - x^2}$$

1 unit down $\searrow$

$$f(x) = -\sqrt{3x - x^2} - 1$$

4 units left $\searrow$

$$f(x) = -\sqrt{3(x+4) - (x+4)^2} - 1$$

Order matters!

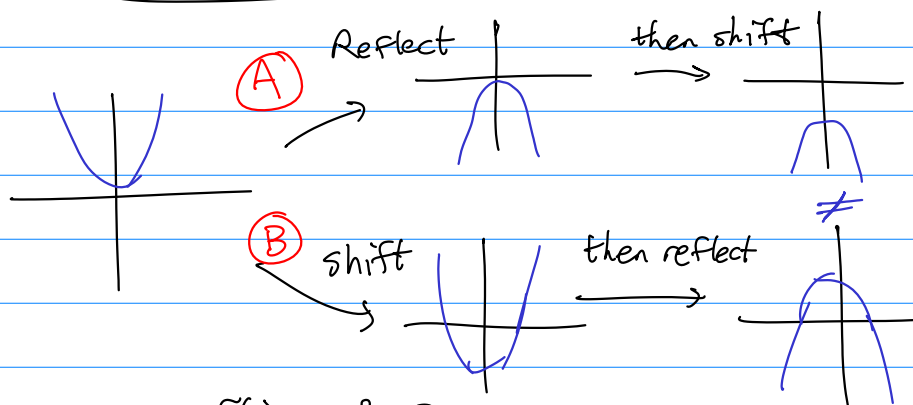$f(x) = x^2$
• Reflection over x-axis
• 3 units down

Ⓐ Reflect $\longrightarrow$ then shift

Ⓑ shift $\longrightarrow$ then reflect $\neq$

Ⓐ
$$f(x) = -x^2$$
$$\searrow f(x) = -x^2 - 3$$

Ⓑ
$$f(x) = x^2 - 3$$
$$\searrow f(x) = -(x^2 - 3) = -x^2 + 3$$

1.3 Compose two or more functions.
  1.3 Decompose a function into two or more functions.

$f(x)$, $g(x)$ are two functions....

$(f + g)(x) = f(x) + g(x)$
  func   func   func

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

etc. $(fg)(x)$, $\left(\frac{f}{g}\right)(x)$

laundry [washer] wet laundry

$\rightarrow$ [dryer] clothes

order matters
  here too!

$f(x) = x^2$ $g(x) = 3x - 1$

Def $(f \circ g)(x) = f(g(x))$

$g(2) = 3(2) - 1$
      $= 6 - 1$
      $= 5$

$(f \circ g)(2) = f(g(2))$

$f(5) = 25$

$(g \circ f)(x) = g(f(x)) = g(x^2) = 3x^2 - 1$