2.2 Power Functions

Definition: Any function that can be written as $f(x) = k \cdot x^a$

where k and a are non zero constants.

** If $a = 0$ $x^0 = 1 \cdot k$ $f(x) = k$ ← constant, not power function

Monomial Functions

Definition: Any function that can be written as $f(x) = k(x^n)$
where k is a constant and a is a nonnegative integer/

Which of the 12 Basic Functions are POWER FUNCTIONS?

f(x)= x ✓   f(x)= $|x|$ ✗   f(x)= e^x ✗

f(x)= x^2 ✓   f(x)= $\frac{1}{x} = x^{-1}$ ✓   f(x)= $\ln x$ ✗

f(x)= x^3 ✓   f(x)= $[x]$ ✗   f(x)= $\sin x$ ✗

f(x)= $\sqrt{x} = x^{\frac{1}{2}}$ ✓   f(x)= logistic ✗   f(x)= $\cos x$ ✗
                        $\frac{1}{1+e^x}$

Direct Variation Functions   Inverse Variation Functions

positive power   negative power

$f(x) = 2x^{139}$ $g(x) = 3x^{-2}$

Graphing Monomials

Ex 3

a) $y = 2x^3$ b) $f(x) = -\dfrac{2}{3}x^4$

from $y = x^3$ parent $f(x) = x^4$

$\lor$ stretch 2 $\lor$ shrink $\frac{2}{3}$

                               $\lor$ reflection x-axis

                                                              $64x^2$
                                                              $(8x)^2$

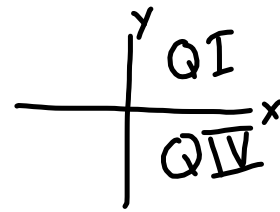because its a monomial it will always be a transformation of a...

$\lor$ stretch/shrink   *outside   #.inside   H stretch/shrink
or reflection   reflection

No $\pm$ so no V/H shift [up/down/left/right]
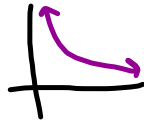
Graphing Power Functions

$$f(x) = k \cdot x^a \quad \text{where } x \geq 0$$

means

Scenarios:

- $a > 1$ think x^2

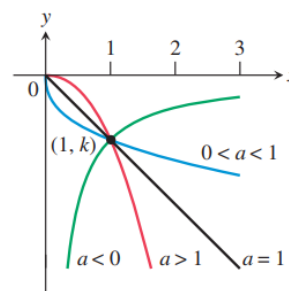- $0 < a < 1$ think $\sqrt{x}$

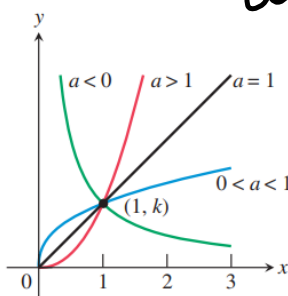- $a = 1$ think x

- $a < 0$ think x^{-1}

$\frac{1}{x}$

What about k?

k>0   Quad I   k<0   Quad IV

all pass through (1, k)

Ex 4 Graphing Power Functions
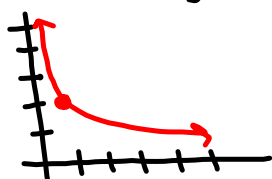
$f(x) = 2x^{-3}$ $f(x) = -0.4x^{1.5}$ $f(x) = -x^{0.4}$

K = 2

K > 0 ∴ QI

a = -3   a<1

passes through (1, 2)

K = -0.4

K < 0 ∴ Q IV

a = 1.5   a > 1
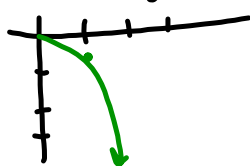
pass through (1, -0.4)

(1, -1)

HW p197 # 27-30, 32-42 evens