

Ex:

C = cost of producing g items

R = revenue made from selling g items

ROC of C with respect to g is 10.8:

$$\frac{\Delta C}{\Delta g} = 10.8 \frac{\$}{\text{item}}$$

$$\Delta C = 10.8 \cdot \Delta g$$



Any unit inc. in g will result in an inc. in C that is 10.8 times larger. [The cost of producing one more unit is \$10.80.]

ROC of R with respect to g is 9.7:

$$\frac{\Delta R}{\Delta g} = 9.7 \frac{\$}{\text{item}}$$

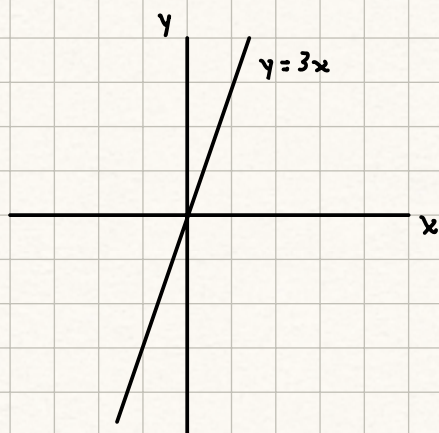
$$\Delta R = 9.7 \cdot \Delta g$$

Any unit inc in g will result in an inc. in R that is 9.7 times as large. [The amount of revenue gained from selling one more item is \$9.70.]

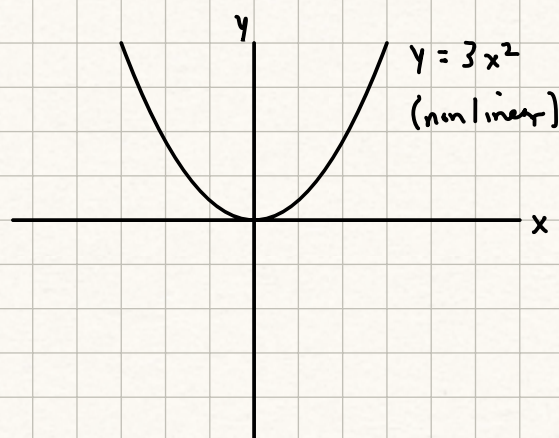
Nonlinear Functions

1. Idea - for linear functions, the ROC is constant (which means the change in output is proportional to the change in input). What if this is not true? What if the proportionality "constant" is not constant?

2. Ex: $y = 3x$
ROC is slope

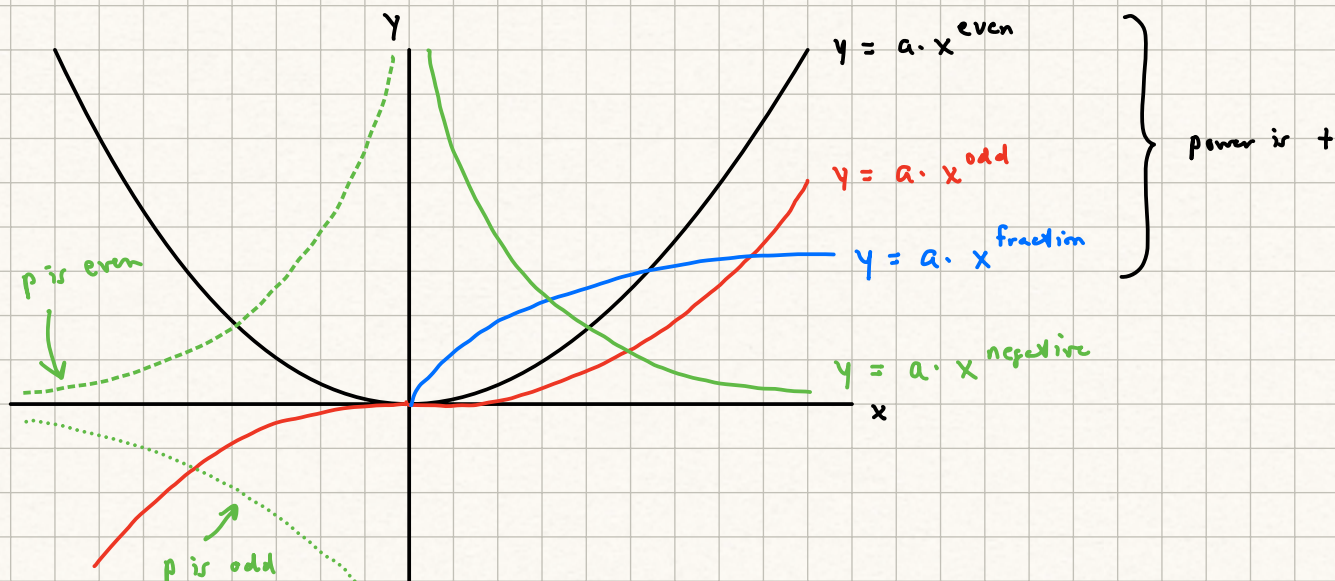


$y = 3x^2$
ROC is no longer constant



3. Power Functions -

$y = a \cdot x^p$
 - a : affects how fast function grows
 - p : variable is in the base
 - p : + growth, - decay
 - a : constant



Recall:

- ① Negative exponents changes numerator and denominator.

Ex: $y = x^{-2} = \frac{1}{x^2}$

$$y = \frac{1}{x^{-3}} = x^3$$

- ② Fractional exponents translate to roots and powers:

$x^{\frac{p}{r}}$
p ← power
r ← root

Ex: $y = x^{\frac{3}{4}} = \sqrt[4]{x^3}$ or $(\sqrt[4]{x})^3$

$$y = \sqrt[5]{x^3} = x^{\frac{3}{5}}$$

$$y = \frac{6}{x^{-3/2}} = 6x^{3/2} = 6\sqrt{x^3}$$

4. Exponential Functions-

y is an exponential function of x iff y inc. or dec. by a constant percent for each unit inc. in x .

$$y = a \cdot b^x$$

constants (parameters)

Ex:

$$y = 78(1.38)^x$$

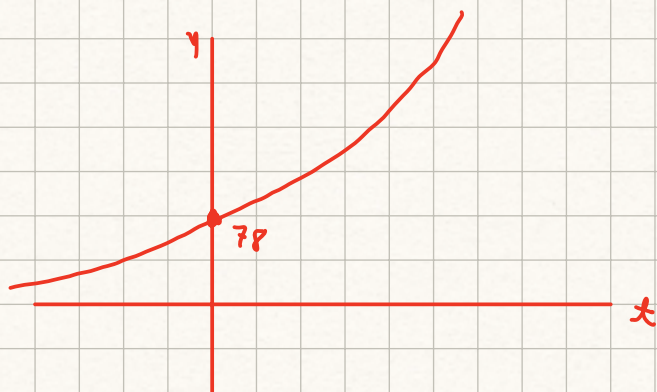
38% growth
initial output (y -intercept)

$$[\text{If } x=1, y = 78(1.38)^1 = 78(1 + 0.38)$$

$$= 78 + 78 \cdot 0.38$$

↑
Additional 38%]

- Identify if it is growth or decay.
- Explain why. $1.38 > 1$
- Identify the initial value. 78
- Identify growth/decay rate. 38%
- Sketch graph.



Ex:

$$y = 2.3 (0.81)^x$$

- Identify if it is growth or decay.
- Explain why. $0.81 < 1$
- Identify the initial value. 2.3
- Identify growth/decay rate. 19%
- Sketch graph.

