2 Oct 09

§3.6 #8

$p = \frac{1}{4}q + 6$ $\qquad$ $p = \frac{2240}{q+12}$

$$\frac{1}{4}q + 6 = \frac{2240}{q+12}$$

$$q + 24 = \frac{8960}{q+12}$$

$$(q+24)(q+12) = 8960$$

$$q^2 + 36q + 24 \cdot 12 = 8960$$

$$q^2 + 36q + 24 \cdot 12 - 8960 = 0$$

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## Last time's big new idea

As $n$ gets bigger and bigger

$$\left(1+\frac{1}{n}\right)^n$$

gets closer and closer to

$$e = 2.7128\ldots$$

We also write

$$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e$$

## §4.2 Logarithmic Functions

$$10^2 = 100$$

is the number of times 10 is multiplied by itself to get 100. We write

$$\log_{10} 100 = 2$$

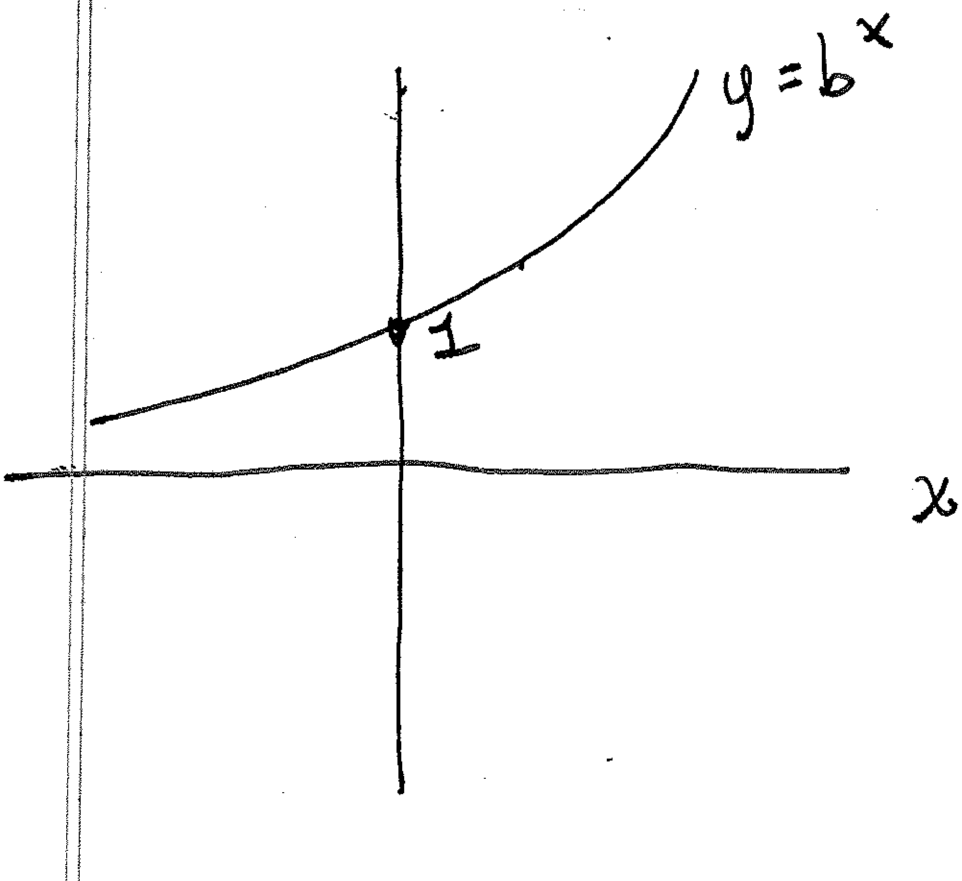
$$125 = 5^3$$

$$\log_5 125 = 3$$

$$\log_b x = y$$

$$\Updownarrow$$

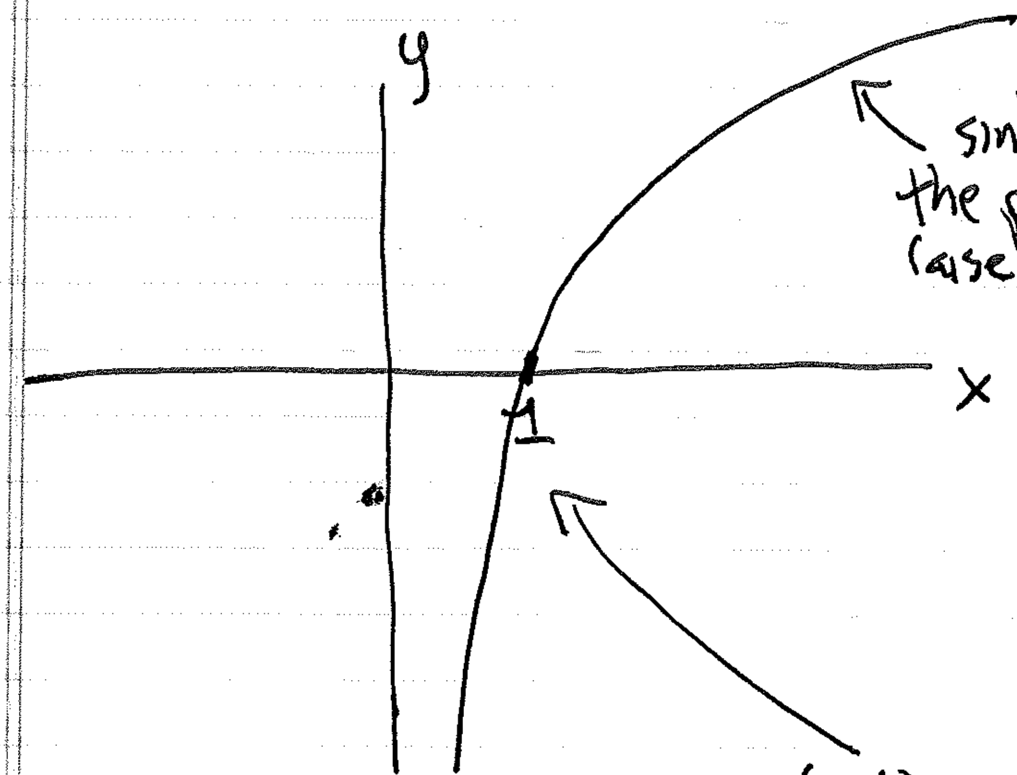
$$b^y = x$$




$b > 1$

What about

$$y = \log_b x \qquad b > 1$$




since y is the power that we raise b to in order to get x

(1,0) is on this graph since $b^0 = 1$

since if $x < 1$ we must raise b to a negative exponent

Inverse functions

$$\log_b b^x = x \qquad \text{since } b^x = b^x$$

$$b^{\log_b x} = x$$

Base 10 and base e are very important

$$\log_{\square} \longleftrightarrow \log_{10}$$

$$\ln \longleftrightarrow \log_e$$

Solve for $x$:

$$\log_2 x = 4$$

means

$$2^4 = x \Rightarrow x = 16$$

## §4.3 Properties of Logarithms

$m, n, r$ numbers

$$\log_b(m \cdot n) = \log_b(m) + \log_b(n)$$

$$\log_b\left(m/n\right) = \log_b(m) - \log_b(n)$$

$$\log_b(m^r) = r \log_b(m)$$

Simplify

6

$$\log_b(1/x^3) = \log_b(1) - \log_b(x^3)$$

$$= 0 - \log_b(x^3)$$

$$= -3\log_b(x)$$

Alternative:

$$\log_b(1/x^3) = \log_b(x^{-3})$$

$$= -3\log_b(x)$$

§ 4.4 Log & Exponential Eqns

$$2\ln(x+4) = 5$$

$$\ln(x+4) = 2.5$$

$$\log_e(x+4) = 2.5$$

$$x+4 = e^{2.5}$$

$$x = e^{2.5} - 4$$

Solve for $x$ : $2^{3x} = 7$

$$\log_2 2^{3x} = \log_2 7$$

$$3x = \log_2 7$$

$$x = \frac{\log_2 7}{3}$$

$$17.6^{3x} = 7$$

$$\log_{10}(17.6^{3x}) = \log_{10} 7$$

$$3x \cdot \log_{10}(17.6) = \log_{10} 7$$

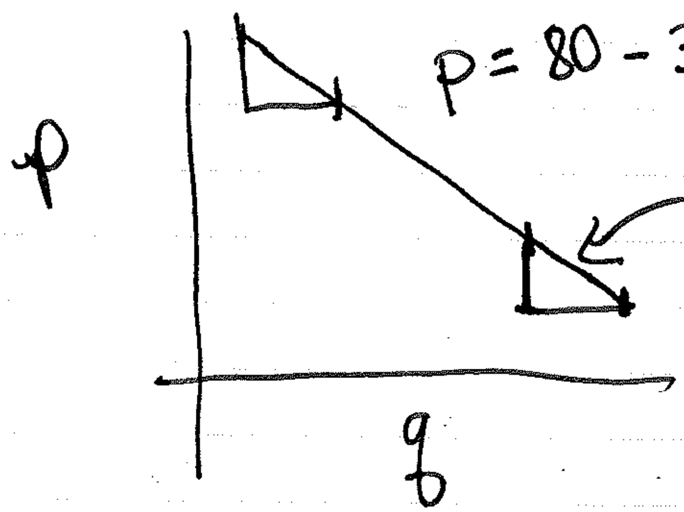
$$x = \frac{\log_{10} 7}{3 \cdot \log_{10}(17.6)}$$

# §10.1 Limits and Continuity

$$\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n = e$$

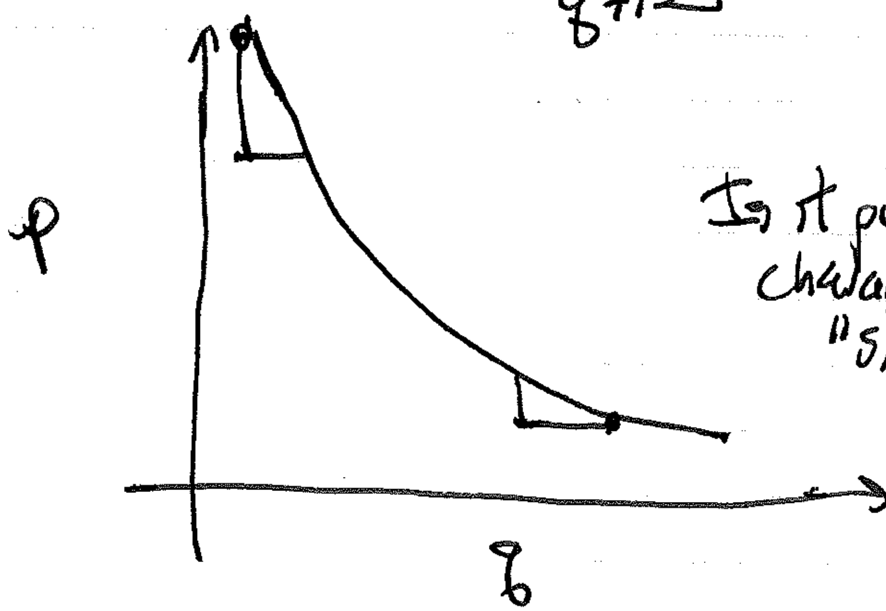
Demand curve

$$p = 80 - 3q$$

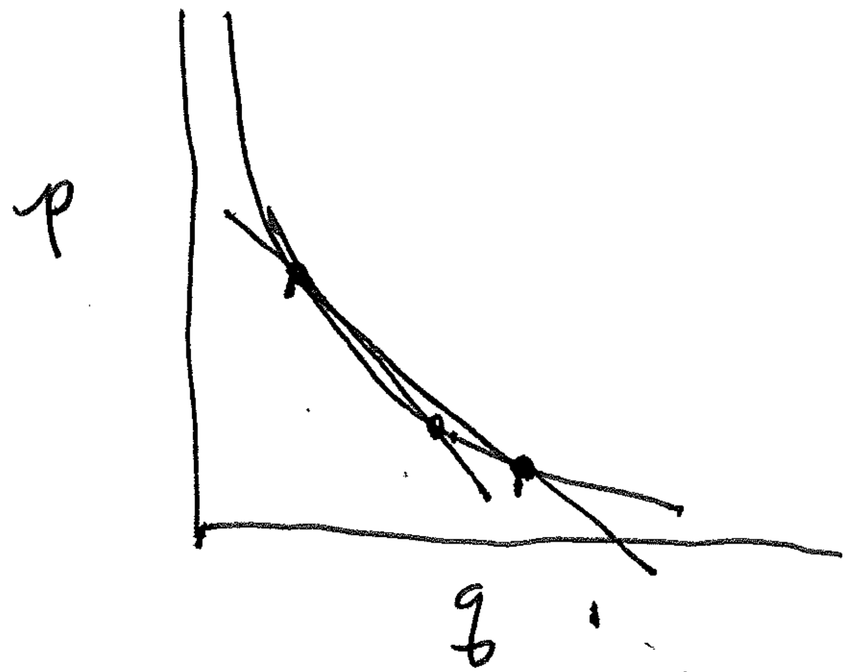


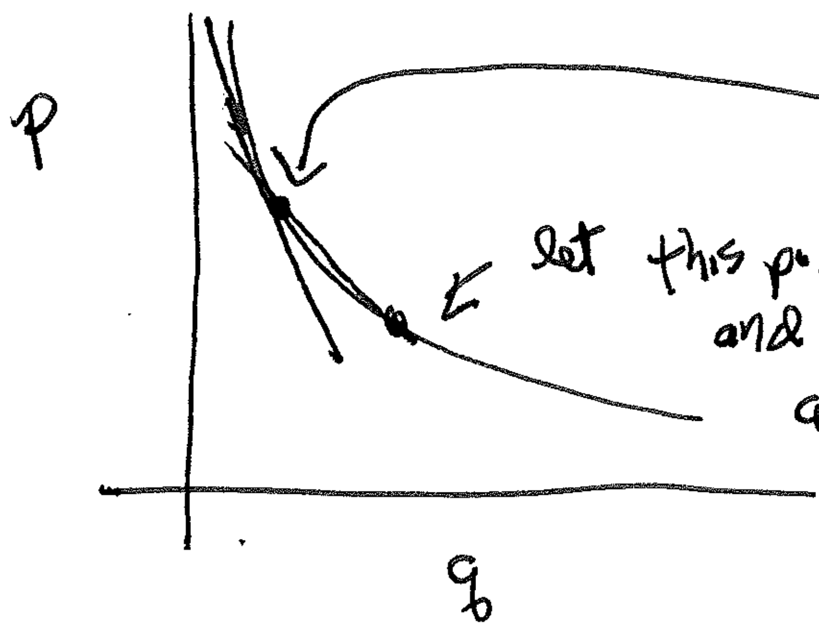

slope tells us how a change in ~~demand is~~ quantity is related to a change in price

What about $p = \dfrac{2240}{q+12}$




Is it possible to characterize the "slope of a curve"?




let this point get closer and closer to this point and ask what happens to the slopes

As these two points get closer and closer together, the slope of the line between them is getting closer and closer to the slope of the line tangent to the curve

We need to think more about limits

The limit of $f(x)$ as $x$ gets closer and to $a$ is the value that $f(x)$ gets closer and closer to.

Note: There may not be a limit

$$\lim_{x \to 2} (x+3) = 5$$

Do not plug $x = a$ into $f(x)$

$$\lim_{x \to 1} \frac{x^3 - 1}{x - 1} = 3 \quad \text{(Let's make a table)}$$