BE - Algebra 2 - Monday

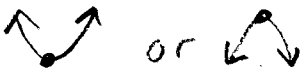
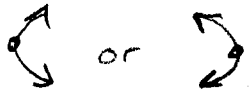
5-14-12

1. Write the "Standard Form" of the Equation for:

(A) Parabola (B) circle

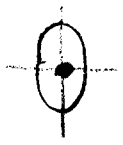
(C) Ellipse (D) hyperbola

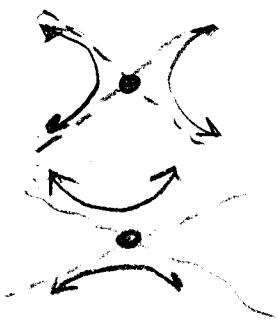
Ref. Ch 8

(A) $y = a(x-h)^2 + k$  or $x = a(y-k)^2 + h$ 

(B) $(x-h)^2 + (y-k)^2 = r^2$ 

(C) $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ 

or $\frac{(y-k)^2}{a^2} + \frac{(x-h)^2}{b^2} = 1$ 

(D) $\frac{(x-h)^2}{a^2} - \frac{(y-k^2)}{b^2} = 1$ 

or $\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$

Alg. 2 Honeywell Review — Pg 564 #15-20

(15) Bacteria, reproduce ⇒ binary fission

⇒ $2^1, 2^2, 2^3 \ldots$

⇒ $t = 20 \text{ min} = \frac{1}{3} \text{ hr}$

Using $B = B_0 e^{kt}$ ⇒ Find k

Since the number of bacteria doubles every 20 min. ⇒ $\frac{B}{B_0} = \frac{2}{1}$

$\therefore \quad 2 = e^{k \cdot 20}$ use $t = 20$ min

$\ln 2 = 20k \ln e$

$.693147 = 20k \quad \therefore \boxed{k \approx 0.034657359}$

(16) The equation to model this growth of bacteria is:

$$\boxed{B = B_0 e^{(0.034657)t}}$$

B_0 = starting number of bacteria

t = time in minutes

Note: if you wanted a formula for t in hours or days, how would you find one?

Ans: Find k using $\frac{20}{60}$ or $\frac{20}{1440}$ ← (min/hr) or (min/day)

(17) GDP of US ↑ 3.2% / Yr from 1985–1999 (14 years)

(in 1996 dollars)

WHAT DOES THIS MEAN?

In 1985 GDP = $5717 billion $= 5717 \times 10^9$

$= \$5.717 \times 10^{12}$

Assuming growth = 3.2% = .032 per year continues. Estimate GDP in 2010 = $t = 25$

$1985 = t = 0 \qquad r = k = 0.32$

Lets compare continuous vs. discrete growth

(A) discrete

$$A = A_0(1+r)^t$$

$$A = 5.712\times10^{12}(1.032)^{25}$$

$$A = 5.712\times10^{12}(2.19782)$$

$$A = 1.2554\times10^{13}$$

$$A = \$12.554 \text{ trillion}$$

Book Answer

Growth in yearly "chunks" of 3.2%. A new dollar waits for a year and suddenly grows 3.2%.

(B) Continuous

$$A = A_0 e^{rt}$$

$$A = 5.712\times10^{12} e^{(.032)25}$$

$$A = 5.712\times10^{12}(2.2255)$$

$$A = 1.2712\times10^{13}$$

$$A = \$12.712 \text{ trillion}$$

Continuous growth at 3.2%. Every new dollar immediately starts to grow at 3.2% per yr.

(18) $GDP = 20\times10^{12} = $ when? $\Rightarrow \frac{A}{A_0} = \frac{20\times10^{12}}{5.712\times10^{12}} \approx 3.501$

$\therefore \log(3.501) = t(\log 1.032)$

$t = \frac{.54419}{.01368}$ $\quad t \approx 39.78 \approx 40 \therefore$ 2025

(19) 1928 Olympics { Woman's High Jump ⇒ 62.5 in
Men's High Jump ⇒ 76.5 in

r for woman ≈ 0.38 % per year
r for men ≈ 0.3 % per year.
t = 0 = 1928

Find year when Woman's = Men's
Assume r stays at .38 and .3 %

$r_w = .38\% = .0038$ $r_m = .3\% = .003$

$H_w = H_0(1+r_w)^t \therefore H_w = 62.5(1.0038)^t$

$H_m = H_0(1+r_m)^t \therefore H_m = 76.5(1.003)^t$

$H_w = H_m \therefore 62.5(1.0038)^t = 76.5(1.003)^t$

$\therefore \frac{76.5}{62.5} = \frac{1.0038^t}{1.003^t}$

$\log(1.224) = \log\left(\frac{1.0038^t}{1.003^t}\right)$

$0.08778 = \log 1.0038^t - \log 1.003^t$

$0.08778 = t(.001647) - t(.001300)$

$0.08778 = .0003463\,t$

$\therefore t = \frac{.08778}{.0003463} \approx 253.5$ year ≈ 254

$\therefore t = 0 = 1925 \Rightarrow \approx$ **2182 $H_w = H_m$**

FYI

Birmingham News
Sunday May 8, 2011 AHSAA
State Track & Field Results

High Jump

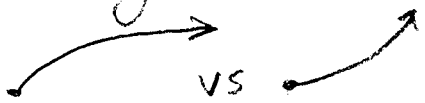
3A Girls = 5'02" = 62 in. Alona @ Bayside

3A Boys = 6'02" = 74 in. Chris @ Rodgers

6A Girls = 5'9" = 69 in. Chardonae @ Hoover

6A Boys = 6'6" = 78 in. Jaylon @ Hoover

Exponential Growth is not a good model for this record



World Record =>
Mens: Javier Sotomayor 8'$\frac{1}{2}$" Cuba 1993
Womens: Stefka Kostadinova 6'10$\frac{1}{2}$" Bulgaria 1987

(20) New House 10 years ago

$C_0 = \$120{,}000$

$C = \$191{,}000$

$t = 10$ years

Assume * steady growth $\Rightarrow$ find r

* (use e)

$$C = C_0 e^{rt}$$

$$191000 = 120000\, e^{10r}$$

$$\frac{191\cancel{000}}{120\cancel{000}} = e^{10r}$$

$$\ln(1.5917) = 10r$$

$$\frac{0.46478}{10} = r$$

$$r = 0.046478$$

$$\boxed{r \approx 4.6\% \text{ per year}}$$

Book used $C = C_0(1+r)^t \cong 4.8\%$

Yearly "chunks" vs steady growth

Homework:

Read
"An Intuitive Guide to
Exponential Functions and e"
(see link @ Bulldogmath.com)