Prof. Kincade

April 6

- Challenge Problem!

$$\log_2(x+1) - \log_4 x = 1$$

$$\log_2(x+1) - \frac{\log_2 x}{\log_2 4} = 1$$

$$(\log_2 4)\cdot \log_2(x+1) - \log_2 x = \log_2 4$$

$$\log_2(x+1)^{\log_2 4} - \log_2 x = \log_2 4$$

$$\log_2(x+1)^2 - \log_2 x = \log_2 4 = 2$$

$$\log_2\left(\frac{(x+1)^2}{x}\right) = 2$$

$$2^2 = \frac{(x+1)^2}{x}$$

$$4x = (x+1)^2 \Rightarrow 4x = x^2+2x+1$$

$$0 = x^2-2x+1$$

$$0 = (x-1)(x-1)$$

$$\boxed{x=1}$$

Solve with Calculator

$$e^{3x-1} = \ln(5x-2) + x^2$$

$$\begin{cases} e^{3x-1} = y_1 \\ \ln(5x-2)+x^2 = y_2 \end{cases}$$

No intersection point!

Section 6.7 — Compound Interest

- $A = P\left(1 + \frac{r}{n}\right)^{nt}$

A: accumulated amount; P: principle; r: rate; t: time; n: number of compounds p/ unit time

→ $n = 1$ yearly
$n = 2$ bi-annually
$n = 4$ quarterly
$n = 12$ monthly
$n = 360$ or 365 (daily)

- 1200 a year ⇒ \$25 a week
- 8% APR (annual percentage rate)
- $n = 4$ ⇒ compounds quarterly

→ $t = 20, 30, 40, 50$

$A = P\left(1 + \frac{r}{n}\right)^{nt}$ ⇒ $A = 1200\left(1 + \frac{.08}{4}\right)^{4t}$

$A = 1200(1.02)^{4t}$

→ $t = 20 \Rightarrow 1200(1.02)^{80} = \$5851$

$t = 30 = " \ 120 = \$12,918$

$= 40 = " \ 160 = \$28,523$

$= 50 = " \ 200 = \boxed{\$62,982}$

Savings Types

IRA, 401k / 403B

→ traditional
→ Roth
→ Up to \$5000 a year, as of 2012

Now, invest \$10,000 at $n = 4$ with 12%

$A = 10000\left(1 + \frac{.12}{4}\right)^{4t}$

$10000(1.03)^{4t}$

$t = 20 \Rightarrow a =$

$A = Pe^{rt}$ ← Compounded Continuously

- Invest $2000 at 10% APR, and compound it continuously, for 3 years. How much interest have you earned?

- $A = 2000e^{(.1)(3)} = 2699.71 \Rightarrow 2699.71 - 2000$
  $= \boxed{699.71 \text{ of interest}}$

Invest $10,000 at 9% interest. I want $400,000. How long will it take me to make that happen? ☆ N = 4

→ $400{,}000 = 10000\left(1+\frac{.09}{4}\right)^{4t}$
$40 = (1.0225)^{4t}$
$\ln 40 = \ln(1.0225)^{4t} \Rightarrow \ln 40 = 4t \cdot \ln(1.0225)$
$\Rightarrow \frac{\ln 40}{4 \cdot \ln(1.0225)} = t = \boxed{41.4 \text{ years.}}$

☆ You'll have the money, but your kid will be 41!

General Exponential Growth & Decay – Section 6.8

$A = A_0 e^{kt}$

A = Final
A_0 = initial value
k = rate
t = time

1) Find A_0
2) Find k
3) Write the equation with t
4) Find any requested info

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8) 2008 – (0, 900,000) } $A_0 = 900{,}000$
2010 – (2, 800,000) } $k = -.05889$ ⇒ $A = 900{,}000 \cdot e^{-0.05889t}$

$A = 900{,}000e^{kt} \Rightarrow 800{,}000 = 900{,}000e^{k(2)} \Rightarrow 8/9 = e^{2k} \Rightarrow \ln 8/9 = 2k$