Questions on Quiz 9/worksheet.

Due tomorrow (Tuesday)

Properties of Logs. §4.3

Break it down

$$\boxed{\begin{aligned}&\log(x^y) = y\log x\\ &\log(xy)\\ &= \log x + \log y\end{aligned}}$$

$$\log\left(\frac{x^2y^3}{\sqrt[4]{z}}\right)$$

$$= \log(x^2) + \log(y^3) - \log(z^{\frac{1}{4}})$$

$$\log\left(\frac{x}{y}\right) = \log x - \log y$$

$$\boxed{\log\left(\frac{x}{y}\right) = \log(xy^{-1})}$$

$$= 2\log x + 3\log y - \frac{1}{4}\log z$$

$A = B \Leftrightarrow 3^A = 3^B$

Solve

$$\log_3(1.025x) = 7$$

Raise 3 to the power of each side.

$$3^{\log_3(1.025x)} = 3^7$$

$$1.025x = 3^7$$

$$\boxed{x = \frac{3^7}{1.025}} \approx \underline{2133.658537}$$

is exactly right

only approximate.

```
Ans*10
          40275.05415
-50*ln(.1)/ln(2)

          166.0964047
3^7/1.025
          2133.658537
```

$$\log_3(1.025x) = 7$$

$$\log_3(1.025) + \log_3(x) = 7$$

$$3^{\log_3(x)} = 3^{7 - \log_3(1.025)}$$

Log of the product is the sum of the logs.

$a^{b+c} = a^b a^c$

$$x = 3^{7 - \log_3(1.025)}$$

$$= 3^7 \, 3^{-\log_3(1.025)}$$

$$3^7 \cdot 3^{\log_3(1.025^{-1})}$$

$$= 3^7 \cdot 1.025^{-1}$$

$$= \frac{3^7}{1.025} \quad \text{Same}$$

$$\frac{3^7}{3^{\log_3(1.025)}}$$

$$\frac{3^7}{1.025} \quad \text{Same}$$

A §4.4 question on three

$\log_2(x+2) + \log_2(x-2) = 5$

$2^{\log_2((x+2)(x-2))} = 2^5$

$(x+2)(x-2) = 32$

$\boxed{x+2 = 32 \quad \text{OR} \quad x-2 = 32}$

NO! Only when right hand is zero can we apply the "Principle of zero products"

Only when the RHS = 0 is factoring any help.

$x^2 - 4 = 32$

$x^2 - 36 = 0$

$x^2 = 36$

$x = \pm 6$

$(x-6)(x+6) = 0$

$x = \pm 6$

$a=1, b=0, c=-36$

$\boxed{b^2 - 4ac = 0^2 - 4(1)(-36)}$

$= 144$

$x = \dfrac{-0 \pm \sqrt{144}}{2(1)}$

$= \pm \dfrac{12}{2} = \pm 6$

Oct 29-10:27 AM

Present Value

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

Suppose A is known, but P is not.

How much in savings today to accumulate \$100,000 in 18 yrs?

$r = .04$, compounded weekly.
$n = 52$

$t = 18$ yrs.

$$100{,}000 = P\left(1+\frac{.04}{52}\right)^{52\cdot 18} \quad \text{Solve for } P.$$

$$P\left(1+\frac{.04}{52}\right)^{52\cdot 18} = 100{,}000$$

$$P = \frac{100{,}000}{\left(1+\frac{.04}{52}\right)^{52\cdot 18}}$$

$$P = 100{,}000\left(1+\frac{.04}{52}\right)^{-52\cdot 18} \approx \$48{,}688.70$$

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

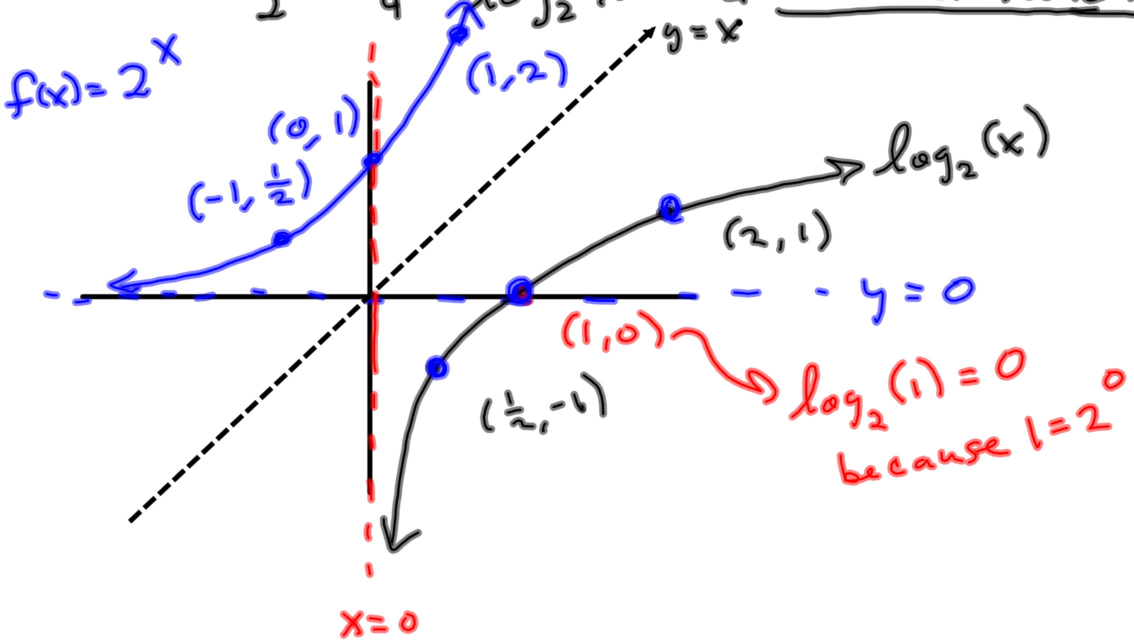
is the present value.

```
        2133.658537
100000(1+.04/52)
^-(52*18)
        48688.69985
Ans*(1+.04/52)^(
52*18)
             100000
```

Check

Graphs of Logarithmic Functions

2^x & $\log_2 x$ are <u>inverse functions</u>



Oct 29-10:44 AM

Assume continuous model.

$A = Pe^{kt}$

In 20 years 2/3 is gone!

where will it be in 50 years?

Want $A = Pe^{50k}$, only we don't know k.

we know: $Pe^{20k} = \frac{1}{3}P$

$$e^{20k} = \frac{1}{3}$$

$$\ln(e^{20k}) = \ln\left(\frac{1}{3}\right)$$

$$20k = \ln\left(\frac{1}{3}\right) = -\ln(3)$$

$$k = -\frac{\ln(3)}{20}$$

So what's left in 50 years?

$$Pe^{50\cdot\left(-\frac{\ln 3}{20}\right)} \approx .0641500299\, P$$

```
          48688.69985
Ans*(1+.04/52)^(
52*18)
               100000
e^(50*-ln(3)/20)

         .0641500299
```

About 6.4% is left.

About 93.6% is gone.

(4.1 #s 50, 56, 104) Like worksheet #9

4.2 #s 36, 38, 44, 46, 132, 134

Annuities -

Sinking Funds - Monthly payments with Future Value Known. is an annuity.

Oct 29-10:59 AM