Plutonium

55% left after 5×10^6 yrs

After 6×10^6 yrs, how much?

$A(t) = Ae^{-kt}$

$Ae^{-5000000k} = .55A$

-5

Let's let t = the # of millions of years.

Then $\boxed{Ae^{-5k} = .55A}$ Bettah

$\frac{\ln(\frac{1}{2})}{-7} = \frac{\ln(2)}{7}$

$e^{-5k} = .55$

$\ln(e^{-5k}) = \ln(.55)$

$-5k = \ln(.55)$

$k = \frac{\ln(.55)}{-5}$

$\frac{\ln(\frac{55}{100})}{-5} =$

$\left((\frac{55}{100}) = (\frac{100}{55})^{-1} \right)$

$= \frac{\ln((\frac{100}{55})^{-1})}{-5}$

$= \frac{-\ln(\frac{100}{55})}{-5}$

$= \frac{\ln(\frac{100}{55})}{5}$

Now, After 6 million yrs, we have $A(6) = Ae^{-6k} = Ae^{-6\left(\frac{\ln(.55)}{-5}\right)}$

```
400)
         .6402838535
ln(.7)/-400
   8.916873598E-4
e^(-6*ln(.55)/-5
)
         .4880173108
```

$\approx A \cdot .4880173108$

$\approx .49A$

49% of initial Amount.

$$f(x) \longrightarrow f(ax) \longrightarrow b\,f(ax) \longrightarrow b\,f(a(x-c))$$

Horiz. flip/stretch — Vert. flip/stretch — right c ($c>0$)

$$\longrightarrow b\,f(a(x-c))+d$$

up d.

The trick: $2-3x = -3\left(x-\frac{2}{3}\right)$

$$x \longrightarrow -3x \longrightarrow -3\left(x-\tfrac{2}{3}\right)$$

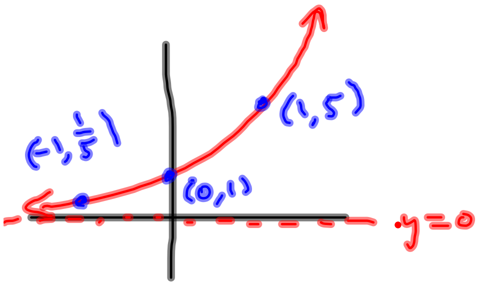
$$g(x) = -5^{1-x} + 7$$

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

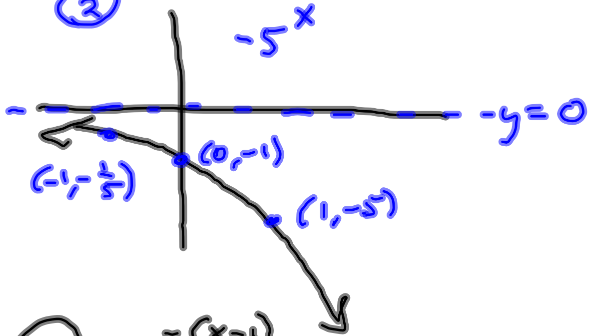
$\boxed{\begin{array}{ccc} x \rightarrow & -x \rightarrow & -(x-1) \\ & \text{Flip} & \text{right } 1 \end{array}}$

① $f(x) = 5^x \longrightarrow$ ② $-5^x \longrightarrow$ ③ $-5^{-x} \longrightarrow$ ④ $-5^{-(x-1)} \longrightarrow$ ⑤ $-5^{-(x-1)} + 7$

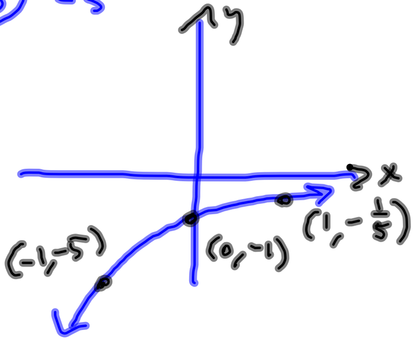
$\updownarrow$ $\quad\leftrightarrow\quad$ Right 1 $\quad$ up 7



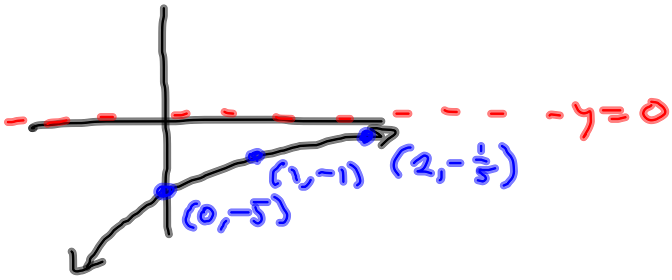
② -5^x



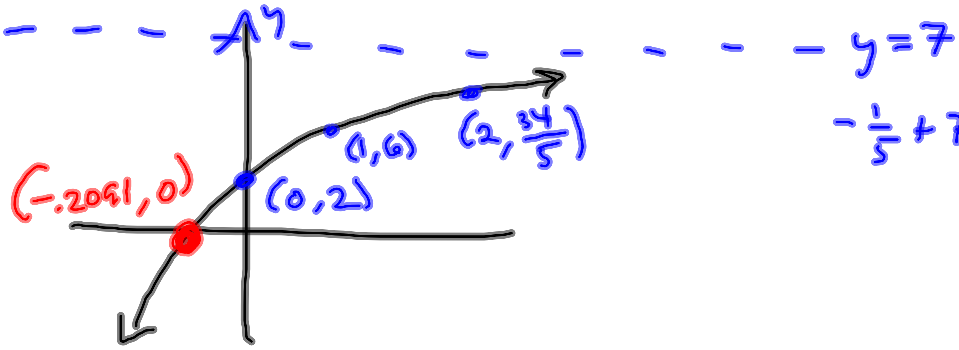
③ -5^{-x}



④ $-5^{-(x-1)}$

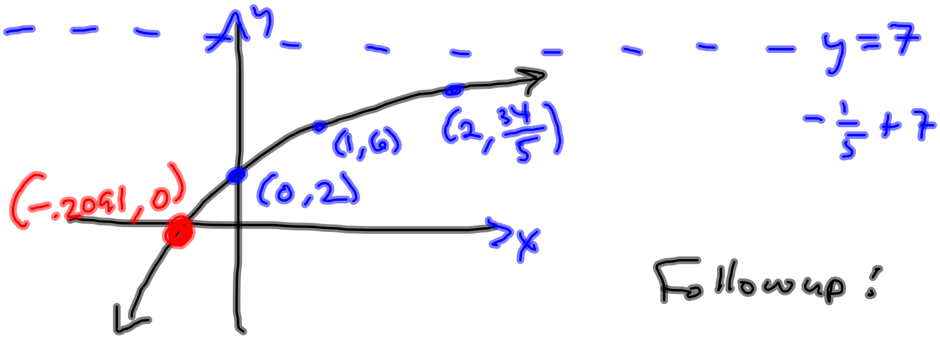


⑤ $-5^{-(x-1)} + 7$



$$-\frac{1}{5} + 7 = -\frac{1}{5} + \frac{35}{5} = \frac{34}{5}$$

(5) $-5^{-(x-1)}+7$



$$-\frac{1}{5}+7=-\frac{1}{5}+\frac{35}{5}=\frac{34}{5}$$

Followup: Find x-intercept.

$$-5^{1-x}+7 \overset{\text{SET}}{=} 0$$

$$-5^{1-x}=-7$$

$$5^{1-x}=7$$

Let $a=\ln(5)$
$b=\ln(7)$

$$\ln(5^{1-x})=\ln(7)$$

$$(1-x)\ln(5)=\ln(7)$$

$$(1-x)a=b$$

$$a-ax=b$$

$$-ax=b-a$$

$$x=\frac{b-a}{-a}$$

$$=\frac{\ln(7)-\ln(5)}{-\ln(5)}$$

$$=\frac{\ln(5)-\ln(7)}{\ln(5)}=\frac{\ln(5)}{\ln(5)}-\frac{\ln(7)}{\ln(5)}$$

$$=1-\ln(7)/\ln(5)$$

$$\approx -.2091$$

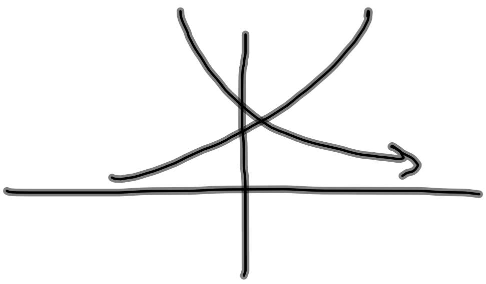
$$\log_5(5^{1-x})=\log_5(7)$$

$$1-x=\log_5(7)$$

$$-x=\log_5(7)-1$$

$$x=1-\log_5(7)$$

$$=1-\ln(7)/\ln(5)$$



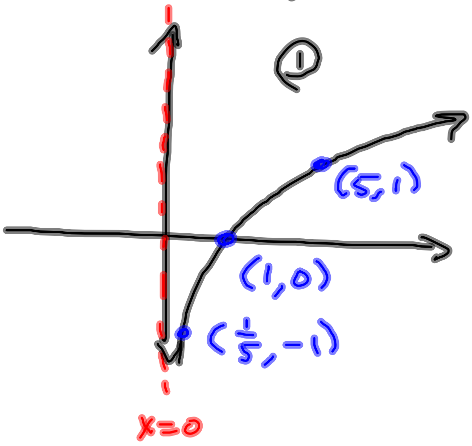
$$3^{2x+1} = 5^{2-3x}$$

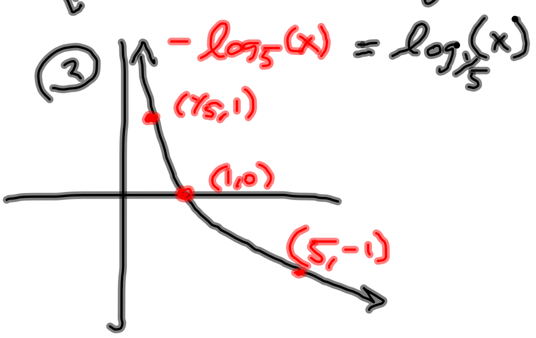
Usually just use ln(both)
$\log_3$(both) & RHS is bad
$\log_5$(both) & LHS is bad.
But one of the other ways might be easier for you.

$g(x) = -\log_5(x-3)$

$f(x) = \log_5(x) \xrightarrow{①} -\log_5(x) \xrightarrow{②} -\log_5(x-3)$ ③

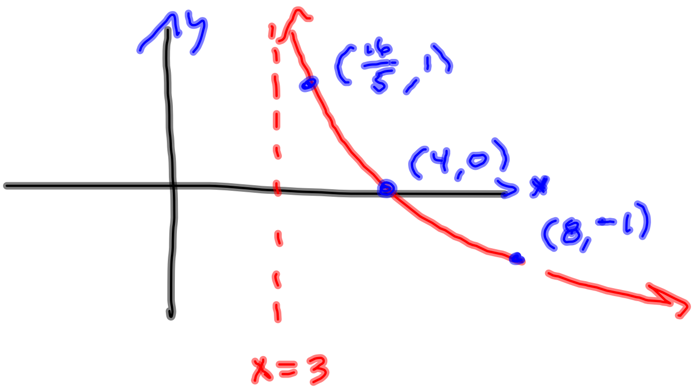
Right 3





$\frac{1}{5}+3$

$-\log_5(x-3)$



~~Simplify~~ write as one logarithm

$\frac{2}{3}\log(7) + 11\log(x-3) - \frac{1}{2}\log(y)$

$= \log(7^{2/3}) + \log((x-3)^{11}) - \log(y^{1/2})$

$= \log\left(\frac{7^{2/3}(x-3)^{11}}{y^{\frac{1}{2}}}\right)$ OR do one like this, in reverse.

Keys to know $\sqrt[5]{x^2} = x^{\frac{2}{5}}$

$\sqrt[m]{x} = x^{\frac{1}{m}}$ $\qquad \sqrt{x^3} = x^{\frac{3}{2}}$

$\sqrt[m]{x^n} = x^{\frac{n}{m}}$

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$$\log\left(\frac{\sqrt[3]{x}\; y^5 z^7}{w^2 t^{-5}}\right) = \log\left(\frac{x^{\frac{1}{3}} y^5 z^7 t^5}{w^2}\right)$$

$$\log(x^{\frac{1}{3}}) + \log(y^3) + \log(z^7) + \log(t^5) - \log(w^2)$$

$$= \frac{1}{3}\log(x) + 5\log(y) + 7\log(z) + 5\log(t) - 2\log(w)$$

What's 148.5426827 yrs, to the nearest day?

$$148\text{yrs} + (.5426827\ \cancel{\text{yrs}})\left(\frac{365\text{ days}}{1\ \cancel{\text{yrs}}}\right)$$

$\approx$ 148 yrs, 198 days.

$$\log_5(x-4) + \log_5(x+2) = \log_5(7)$$

$$\log_5\big((x-4)(x+2)\big) = \log_5(7)$$

$$(x-4)(x+2) = 7$$

$$x^2 + 2x - 4x - 8 = x^2 - 2x - 8 = 7$$

$$x^2 - 2x - 15 = 0$$

$$(x-5)(x+3) = 0$$

$\boxed{x = 5}$ or $x = -3$ $\notin$ Domain of the problem.

Final Answer

Mar 30-9:45 AM

I urge you to look @ Fall '10 Test.

$A = P(1+\frac{r}{m})^{mt} \Longrightarrow \frac{A}{(1+\frac{r}{m})^{mt}} = P =$

Future value of savings.

$P = A\boxed{(1+\frac{r}{m})}^{-mt}$

= Present value of \$A in t years

$(1.1)^{-1} = \frac{1}{1.1}$

$\log_5(7) = \ln(7)/\ln(5)$

Mar 30-9:52 AM