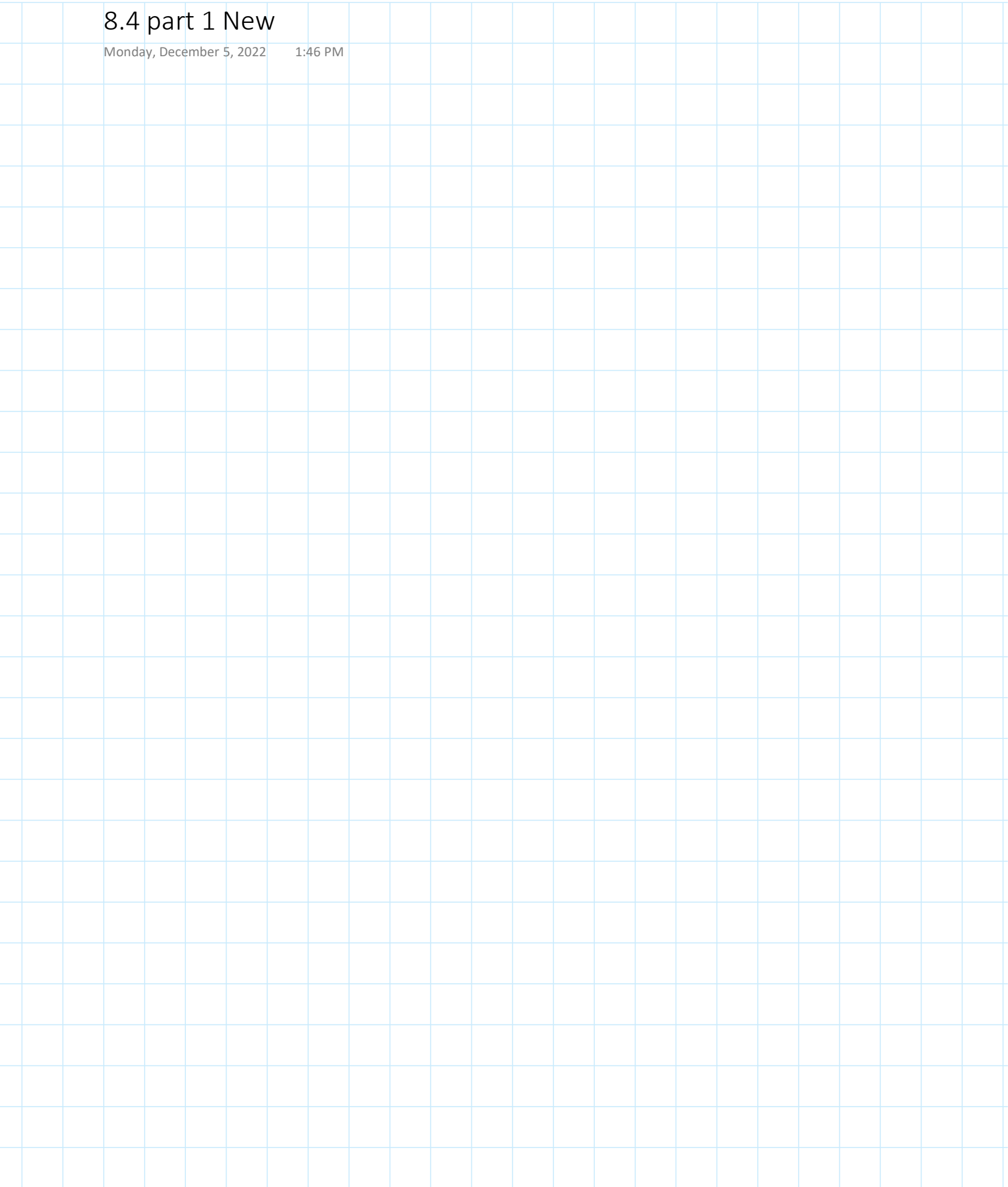
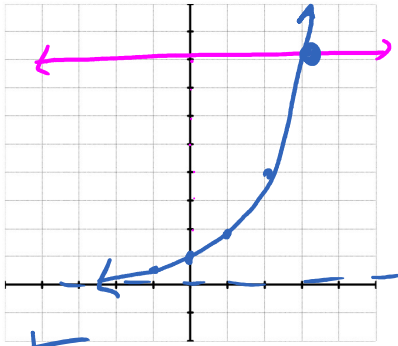


8.4 part 1 New

Monday, December 5, 2022 1:46 PM



8.4 Part 1 Solving Exponential Equations

Can be solved by writing both sides in the same base	Can be solved by graphing	Can be solved by changing to logarithmic form
<p>① $2^{3x+1} = 8$</p> $2^{3x+1} = 2^3$ $3x+1 = 3$ $3x = 2$ $x = \frac{2}{3}$ <p>$2^{3x+1} = 7$</p>	<p>$y = 2^x$ $2^x = 8$ $y = 8$</p>  <p>$x = 3$</p> <p>$2^x = 11$</p> <p>$\begin{array}{r l} -1 & 1/2 \\ 0 & 1 \\ 1 & 2 \\ 2 & 4 \\ 3 & 8 \end{array}$</p>	<p>$3^x = 25$</p> $\log_3 25 = x$ $\frac{\log_{10} 25}{\log_{10} 3} = x$ $x = 2.93$ <p>$3^{x+2} = 25$ $x = 11$</p>

$$c, L, R > 0 \quad c \neq 1$$

$$\text{if } L = R$$

apply a log to both sides, then

$$\log_c L = \log_c R$$

$$(\sqrt{x})^2 = (9)^2$$

$$x = 81$$

$$\frac{5x}{5} = \frac{32}{5}$$

Ex. #1: Solve $\frac{3(5^{x+2})}{3} = \frac{360}{3}$

$$5^{x+2} = 120$$

$$\log 5^{x+2} = \log 120$$

$$(x+2) \log 5 = \log 120$$

$$x \log 5 + 2 \log 5 = \log 120$$

$$\frac{x \log 5}{\log 5} = \frac{(\log(120) - 2 \log(5))}{\log(5)} \quad x = 0.97$$

Ex. #2: Solve $3^{x+1} = 5^{2x-3}$

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

$$(x+1) \log 3 = (2x-3) \log 5$$

$$x \log 3 + \log 3 = 2x \log 5 - 3 \log 5$$

$$3 \log 5 + \log 3 = 2x \log 5 - x \log 3$$

$$\frac{3 \log 5 + \log 3}{(2 \log 5 - \log 3)} = \frac{x(2 \log 5 - \log 3)}{(2 \log 5 - \log 3)}$$

$$\frac{(3 \log 5 + \log 3)}{(2 \log 5 - \log 3)} = x \quad x = 2.8$$

Ex. #3: Solve $7(2^x) = 5^{x-2}$

$$\log(7(2^x)) = \log 5^{x-2}$$

$$\log 7 + \log 2^x = \log 5^{x-2}$$

$$\log 7 + x \log 2 = (x-2) \log 5$$

$$\log 7 + x \log 2 = x \log 5 - 2 \log 5$$

$$2 \log 5 + \log 7 = x \log 5 - x \log 2$$

$$2 \log 5 + \log 7 = x (\log 5 - \log 2)$$

$$\frac{2 \log 5 + \log 7}{\log 5 - \log 2} = x$$

Ex. #4: Lead-210 is radioactive. Over 5 years, 8 g of lead decays to 6.75 g. What is the half-life?

$$A = 6.75$$

$$A_0 = 8$$

$$c = \frac{1}{2}$$

$$t = 5$$

$$T = ?$$

$$A = A_0 (c)^{t/T}$$

$$\frac{6.75}{8} = \frac{8 \left(\frac{1}{2}\right)^{5/T}}{8}$$

$$\frac{6.75}{8} = \left(\frac{1}{2}\right)^{5/T}$$

$$\log\left(\frac{6.75}{8}\right) = \log\left(\frac{1}{2}\right)^{5/T}$$

$$T \log\left(\frac{6.75}{8}\right) = \cancel{5} \log\left(\frac{1}{2}\right)$$

$$T \log\left(\frac{6.75}{8}\right) = \frac{5 \log\left(\frac{1}{2}\right)}{\log\left(\frac{6.75}{8}\right)}$$

$$T = \frac{5 \log\left(\frac{1}{2}\right)}{\log\left(\frac{6.75}{8}\right)}$$

$$T = 20.4 \text{ years}$$