

# Exp/Log Review

$$1. f(x) = 5\left(\frac{2}{3}\right)^x \quad b = \frac{2}{3} \Rightarrow b < 1 \text{ decay}$$

$$2. f(x) = \frac{1}{3}\left(\frac{6}{5}\right)^x \quad b = \frac{6}{5} \Rightarrow b > 1 \text{ growth}$$

$$3. e^6 = x - 2 \Rightarrow \ln(x - 2) = 6$$

$$4. 10^{2x} = 54 \Rightarrow \log_{10} 54 = 2x \Rightarrow \log 54 = 2x$$

$$5. \log_x 7 = \frac{1}{2} \Rightarrow x^{1/2} = 7$$

$$6. \ln x = 38 \Rightarrow e^{38} = x$$

$$7. \frac{1}{2} \log_5 324 - \log_5 2$$

$$= \log_5 324^{1/2} - \log_5 2$$

$$= \log_5 18 - \log_5 2 = \log_5 \left(\frac{18}{2}\right) = \log_5 9$$

$$8. 3 \cdot \ln 6 - \frac{3}{2} \cdot \ln 4$$

$$= \ln 6^3 - \ln 4^{3/2} = \ln 216 - \ln 8 = \ln \left(\frac{216}{8}\right)$$

$$= \ln 27$$

$$9. \log_4 \sqrt{p^3 q^{10}} = \log_4 (p^3 q^{10})^{1/2} = \log_4 p^{3/2} q^5$$

$$= \log_4 p^{3/2} + \log_4 q^5$$

$$= \frac{3}{2} \log_4 p + 5 \log_4 q$$



$$10. \ln\left(\frac{2}{a^3}\right)^4 = \ln\left(\frac{2^4}{a^{12}}\right) = \ln 2^4 - \ln a^{12}$$

$$= 4 \cdot \ln 2 - 12 \cdot \ln a$$

$$11. \log_4(5x+7) = \log_4(2x+31)$$

$$5x+7 = 2x+31$$

$$3x = 24$$

$$\boxed{x=8}$$

$$12. \ln(p^2-p) = \ln(6p+18)$$

$$p^2-p = 6p+18$$

$$p^2-7p-18=0$$

$$(p+2)(p-9)=0$$

$$\boxed{p=-2} \mid \boxed{p=9} \quad \checkmark$$

$$\begin{array}{r} -10 \\ -9 \times 2 \\ \hline -18 \end{array}$$

$$13. \frac{1}{2} \log_8 36 + \log_8(3k+7) = \log_8 132$$

$$\log_8 36^{1/2} (3k+7) = \log_8 132$$

$$6(3k+7) = 132$$

$$18k+42 = 132$$

$$18k = 90$$

$$\boxed{k=5} \quad \checkmark$$

$$14. 2 \cdot \ln(y+5) = \ln(20) - \ln(5)$$

$$\ln(y+5)^2 = \ln(20/5)$$

$$(y+5)^2 = 4 \Rightarrow y^2 + 10y + 25 = 4$$

$$y^2 + 10y + 21 = 0$$

$$(y+7)(y+3) = 0$$

$$y = -7 \mid \boxed{y=-3}$$



$$15. \log_2(9m+2) = 7$$

$$2^7 = 9m+2$$
$$128 = 9m+2 \quad \int \begin{matrix} 126 = 9m \\ \boxed{14 = m} \end{matrix} \checkmark$$

$$16. \frac{5 \cdot \ln(2a-1)}{5} = \frac{15}{5} \rightarrow \ln(2a-1) = 3$$

$$e^3 = 2a-1 \rightarrow \frac{e^3+1}{2} = a = \boxed{10.5428}$$

$$17. 64^{x-7} = 4^{5x-3}$$
$$(2^6)^{x-7} = (2^2)^{5x-3}$$
$$2^{6x-42} = 2^{10x-6}$$
$$6x-42 = 10x-6$$
$$-36 = 4x$$
$$\boxed{-9 = x}$$

$$18. 9^{w-8} = \left(\frac{1}{27}\right)^{2w}$$
$$(3^2)^{w-8} = (3^{-3})^{2w}$$
$$3^{2w-16} = 3^{-6w}$$
$$2w-16 = -6w$$
$$-16 = -8w$$
$$\boxed{2 = w}$$

$$19. 8^{n-5} = 48 \quad \text{No Common Base!}$$

$$\log_8 48 = n-5 \rightarrow \frac{\log 48}{\log 8} = n-5$$

$$\frac{\log 48}{\log 8} + 5 = n = \boxed{6.8617}$$

$$21. e^{a+1} = 65 \rightarrow \ln(65) = a+1$$

$$\ln(65) - 1 = a = \boxed{3.1749}$$



$$22. \begin{aligned} -3 \cdot e^{2m-5} - 7 &= -34 \\ -3 \cdot e^{2m-5} &= -27 \\ e^{2m-5} &= 9 \end{aligned} \quad \left. \begin{aligned} \ln(9) &= 2m-5 \\ \ln(9)+5 &= 2m \\ \frac{\ln(9)+5}{2} &= m \end{aligned} \right\}$$

$$\boxed{3.5986 = m}$$

Growth

21/24.  $a = 200$

$r = 7\% \Rightarrow 0.07$

$t = 2016 - 1980 = 36$

$f(\frac{t}{6}) = 200(1.07)^6$

$f(36) = 200(1.07)^{36}$

$\boxed{\$2,284.79}$

25. Compound.

$P = 2400$

$r = 1.8\% \Rightarrow 0.018$

$n$ : bimonthly  $\Rightarrow 6$

$t$ : 25

$A = 2400 \left(1 + \frac{0.018}{6}\right)^{6 \cdot 25}$

$= 2400(1.003)^{150}$

$= \boxed{\$3761.41}$

26. Compound

$P = 30,000$

$r = 4\% \Rightarrow 0.04$

$n$ : quarterly  $\Rightarrow 4$

$t$ : 12

$A = 30000 \left(1 + \frac{0.04}{4}\right)^{4 \cdot 12}$

$30000(1.01)^{48}$

$= \boxed{\$48,366.78}$

27.  $f(t) = (1.05)^{\frac{t}{2}} = (1.05^{1/2})^{12t}$

$1.05^{1/2} = 1.0041 \Rightarrow \boxed{0.41\%}$

28.  $12(2)^{x+2} = 3 \cdot 4(2)^{x+2} = 3 \cdot 2^2 \cdot (2)^{x+2}$   
 $= \cancel{12} \cdot \boxed{3(2)^{x+4}} \quad B$

29.  $\frac{(2a+4)^2}{2} = \frac{4a^2 + 16a + 16}{2} = \boxed{2a^2 + 8a + 8}$

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