

2. [12 points] Solve each of the equations below.

Show your work step-by-step and give the **exact solutions** in the answer blanks provided.

a. [3 points] $4(3.2)^t = 7$

Solution: Dividing both sides of the equation by 4 we find $(3.2)^t = 1.75$. We then use logarithms to find t .

$$\log((3.2)^t) = \log(1.75)$$

$$t \log(3.2) = \log(1.75)$$

$$t = \frac{\log(1.75)}{\log(3.2)}$$

Answer: $t = \frac{\log(1.75)}{\log(3.2)}$

b. [3 points] $3e^{\ln(x+2)} = 8$

Solution: Dividing both sides of the equation by 3, we have $e^{\ln(x+2)} = \frac{8}{3}$. Since $e^{\ln(x+2)} = x + 2$, we find that $x + 2 = \frac{8}{3}$ so $x = \frac{8}{3} - 2 = \frac{2}{3}$.

$$\frac{2}{3}$$

Answer: $x = \frac{2}{3}$

c. [3 points] $e^{m+5} = 6e^{-3m}$

Solution:

We first take the natural logarithm of both sides of the equation. Using properties of logarithms we can then solve for m .

$$\ln(e^{m+5}) = \ln(6e^{-3m})$$

$$\ln(e^{m+5}) = \ln(6) + \ln(e^{-3m})$$

$$m + 5 = \ln(6) - 3m$$

$$4m = \ln(6) - 5$$

$$m = \frac{\ln(6) - 5}{4}$$

Answer: $m = \frac{\ln(6) - 5}{4}$

d. [3 points] $\ln(y + 3) - \ln(1 - y) = \ln(6)$

Solution: We rewrite the left side of the equation as $\ln\left(\frac{y+3}{1-y}\right)$. Then $\ln\left(\frac{y+3}{1-y}\right) = \ln(6)$ so exponentiating we have $e^{\ln\left(\frac{y+3}{1-y}\right)} = e^{\ln(6)}$ and hence $\frac{y+3}{1-y} = 6$. Then $y + 3 = 6(1 - y)$ so $y + 3 = 6 - 6y$. Hence $7y = 3$ and finally $y = 3/7$.

$$\frac{3}{7}$$

Answer: $y = \frac{3}{7}$