Honors Algebra II/Trig 　　　　　　　　　　　　　　　　　　　**Name** Key

7.4 Day 1 Worksheet

Simplify.

1. $\log_8 4\sqrt{2}$

$8^x = 4\sqrt{2}$

$2^{3x} = 2^2 \cdot 2^{1/2}$

$2^{3x} = 2^{5/2}$

$3x = 5/2$

$\boxed{x = \frac{5}{6}}$

2. $6^{1+\pi} \cdot 6^{2-\pi}$

$6^3 = \boxed{216}$

3. $\sqrt{32} \cdot \sqrt[10]{32}$

$(2^5)^{\frac{1}{2}} \cdot (2^5)^{\frac{1}{10}}$

$2^{5/2} \cdot 2^{1/2}$

$2^3 = \boxed{8}$

4. $\log_2(\log_5(\log_3 243))$

$\log_2(\log_5 5)$

$\log_2 1$

$\boxed{0}$

Solve for x.

5. $\log_{27} 81 = x$

$27^x = 81$

$3^{3x} = 3^4$

$3x = 4$

$\boxed{x = 4/3}$

6. $\log_x 8 = \frac{3}{4}$

$x^{3/4} = 2^3$

$x = (2^3)^{4/3}$

$x = 2^4$

$\boxed{= 16}$

Solve each equation. Calculator permitted.

7. $3(2^{x+3}) = 11$

$2^{x+3} = 11/3$

$\log_2 11/3 = x+3$

$\boxed{-1.126 = x}$

8. $3e^{2x} = 10$

$e^{2x} = 10/3$

$\ln 10/3 = 2x$

$\boxed{.602 = x}$

9. $3 + \ln(x+1) = 5$

$\ln(x+1) = 2$

$e^2 = x+1$

$\boxed{x = 6.389}$

10. The size of a mosquito population grows exponentially. If there are 50 mosquitos initially and there are 80 after 1 day, how many will there be in 8 days? When will the population reach 1000?

$y = a \cdot b^x$

(0, 50)
(1, 80)

$50 = a \cdot b^0$

$50 = a$

$y = 50b^x$

$80 = 50 \cdot b^1$

$\frac{8}{5} = b$

$y = 50\left(\frac{8}{5}\right)^x$

$y = 50\left(\frac{8}{5}\right)^8$

$= \boxed{2147 \text{ mosquitos}}$

$1000 = 50\left(\frac{8}{5}\right)^x$

$20 = \left(\frac{8}{5}\right)^x$

$\log_{\frac{8}{5}} 20 = x$

$\boxed{6.37d\ldots = x}$

11. The population of the US is increasing exponentially with time. In 1970, the population was about 203 million. In 1980, the population was about 226 million. Write the particular equation expressing population in terms of the number of years that have elapsed since 1970. When will the population reach 400 million?

1970 = time 0

(0, 203)

(10, 226)

$y = 203 \cdot b^x$

$226 = 203 \cdot b^{10}$

$\left(\frac{226}{203}\right)^{\frac{1}{10}} = b$

$y = 203\left(\frac{226}{203}\right)^{\frac{x}{10}}$

$400 = 203\left(\frac{226}{203}\right)^{\frac{x}{10}}$

$\frac{400}{203} = \left(\frac{226}{203}\right)^{\frac{x}{10}}$

$\log_{\frac{226}{203}}\left(\frac{400}{203}\right) = \frac{x}{10}$

$63.2 = x$

$1970 + 63 = \boxed{2033}$

12. When rabbits were first brought to Australia, they had no natural enemies so their numbers increased rapidly. Assume that there were 60,000 rabbits in 1865 and by 1867 there were 2.4 million. Assume that the number of rabbits increases exponentially with the number of years that elapsed since 1865. Write the particular equation for this function. When was the first pair of rabbits introduced into Australia?

(0, 60,000)

(2, 2,400,000)

$y = 60{,}000\, b^x$

$2400000 = 60000\, b^2$

$40 = b^2$

$\sqrt{40} = b$

$y = 60{,}000\,(40)^{\frac{x}{2}}$

$2 = 60{,}000\,(40)^{\frac{x}{2}}$

$\frac{1}{30{,}000} = 40^{\frac{x}{2}}$

$\log_{40} \frac{1}{30{,}000} = \frac{x}{2}$

$-5.59 = x$

1865 − 6

1859
first pair
rabbits
introduced
in Australia