

# Math 151 - Quiz 10

May 4, 2016

Name key  
Score \_\_\_\_\_

Show all work to receive full credit. Supply explanations when necessary.

1. (4 points) Radioactive radium-226 has a half-life of 1600 years. Use the exponential decay model,  $P(t) = P_0 a^t$ , to determine how much of a 10-gram sample will remain after 975 years.

$$a^{1600} = \frac{1}{2} \Rightarrow a = \sqrt[1600]{\frac{1}{2}}$$

$$P(t) = 10 \left( \sqrt[1600]{\frac{1}{2}} \right)^t \Rightarrow P(975) = 10 \left( \sqrt[1600]{\frac{1}{2}} \right)^{975} \approx 6.55 \text{ grams}$$

2. (3 points) Determine the exact value of each logarithm. Show work or explain.

(a)  $\log_5 125 = 3$

BECAUSE  $5^3 = 125$

(b)  $\log_{1/2} 64 = -6$

BECAUSE  $\left(\frac{1}{2}\right)^{-6} = 2^6 = 64$

(c)  $\ln \sqrt{e} = \ln e^{1/2} = \frac{1}{2}$

3. (1.5 points) Use the logarithm laws to completely expand:  $\log \left( \frac{x^5 y^2}{\sqrt{z}} \right)$ .

$$5 \log x + 2 \log y - \frac{1}{2} \log z$$

4. (1.5 points) Use the logarithm laws to completely condense:  $4 \log_2 x - \log_2 y - 3 \log_2 z$

$$= \log_2 x^4 - \log_2 y - \log_2 z^3$$

$$= \log_2 \left( \frac{x^4}{y z^3} \right)$$