

# Math 130 - Quiz 11

November 20, 2019

Name key

Score \_\_\_\_\_

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

1. (5 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.

$$\frac{1}{2} = a^{1600} \Rightarrow a = \left(\frac{1}{2}\right)^{1/1600}$$

$$P(t) = 10 \left(\frac{1}{2}\right)^{t/1600}$$

$$P(975) = 10 \left(\frac{1}{2}\right)^{975/1600} \approx \boxed{6.55 \text{ grams}}$$

2. (5 points) Determine the exact value of each logarithm. Show work or explain.

(a)  $\log_5 125$

$$= \log_5 5^3 = \boxed{3}$$

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

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

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

Turn over.

3. (2 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. (2 points) Use the logarithm laws to completely condense:  $4 \log_2 x - \log_2 y - 3 \log_2 z$

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

5. (1 point) Write  $\log_9 137$  in terms of natural logarithms. Then use your calculator to compute the value.

$$\frac{\ln 137}{\ln 9} \approx 2.2391798$$