AP Calculus
6.4 Worksheet

All work must be shown in this course for full credit. Unsupported answers may receive NO credit.

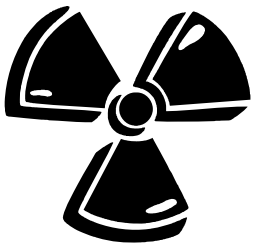
1. Suppose the rate of change of ☺ is proportional to the amount of ☺ present.

   a) Write the differential equation that this statement represents.

   b) Solve the differential equation from part *a* … do not skip ANY steps.

Remember … if you MUST know how to solve differential equations like the one above, but you may jump straight to the solution if you are solving problems.

2. **Radioactive Decay**: The rate at which a radioactive element decays (as measured by the number of nuclei that change per unit of time) is approximately proportional to the amount of nuclei present. Suppose that 10 grams of the plutonium isotope Pu-239 was released in the Chernobyl nuclear accident. How long will it take for the 10 grams to decay to 1 gram? [Pu-239 has a half life of 24,360 years]



3. Bacteria in a certain culture increase at rate proportional to the number present. If the number of bacteria doubles in three hours, in how many hours will the number of bacteria triple?

A) $\frac{3\ln 3}{\ln 2}$

B) $\frac{2\ln 3}{\ln 2}$

C) $\frac{\ln 3}{\ln 2}$

D) $\ln\left(\frac{27}{2}\right)$

E) $\ln\left(\frac{9}{2}\right)$

4. If $\frac{dy}{dt} = -2y$ and if $y = 1$ when $t = 0$, what is the value of t for which $y = \frac{1}{2}$?

A) $-\frac{1}{2}\ln 2$

B) $-\frac{1}{4}$

C) $\frac{1}{2}\ln 2$

D) $\frac{\sqrt{2}}{2}$

E) $\ln 2$

5. A puppy weighs 2.0 pounds at birth and 3.5 pounds two months later. If the weight of the puppy during its first 6 months is increasing at a rate proportional to its weight, then how much will the puppy weigh when it is 3 months old?

A) 4.2 pounds

B) 4.6 pounds

C) 4.8 pounds

D) 5.6 pounds

E) 6.5 pounds

6. During a certain epidemic, the number of people that are infected at any time increases at rate proportional to the number of people that are infected at that time. If 1,000 people are infected when the epidemic is first discovered, and 1,200 are infected 7 days later, how many people are infected 12 days after the epidemic is first discovered?

A) 343

B) 1,343

C) 1,367

D) 1,400

E) 2,057

7. Population y grows according to the equation $\frac{dy}{dt} = ky$, where k is a constant and t is measured in years. If the population doubles every 10 years, then the value of k is

A) 0.069

B) 0.200

C) 0.301

D) 3.322

E) 5.000

8. Complete the following questions from the textbook: page 357: #1, 3, 5, 6, 7, 8, 9, 10, 42, 43