Exponential Functions Worksheet

Construct & Solve Exponential Functions Std. 3 – F.BF-5

Name: KEY Period:________

1. A certain type of bacterium increases according to the model $P(t) = 100e^{0.2197t}$, where t is the time in hours. Find (a) P(0), (b) P(5), and (c) P(10)

a) $P(0) = 100e^{0.2197(0)} = 100e^0 = 100$

b) $P(5) = 100e^{0.2197(5)} \approx 300$

c) $P(10) = 100e^{0.2197(10)} \approx 900$

2. The population of a town increases according to the model $P(t) = 2500e^{0.0293t}$, where t is the time in years, with t = 0 corresponding to 2000. Use the model to estimate the population in (a) 2010 and (b) 2020. (c) What was the population of the town in 1974?

a) $P(10) = 2500e^{0.0293(10)} \approx 3352$

b) $P(20) = 2500e^{0.0293(20)} \approx 4492$

c) $P(-26) = 2500e^{0.0293(-26)} \approx 1167$

3. In 2010 Mexico had a population of approximately 110 million people. The population of Mexico increases according to the model $P(t) = 110e^{0.0142t}$. Use the model to estimate population of Mexico in (a) 2026, (b) 2060 and (c) 1960.

a) $P(16) = 110e^{0.0142(16)} \approx 138$ million (138.1)

b) $P(50) = 110e^{0.0142(50)} \approx 224$ million (223.7)

c) $P(-50) = 110e^{0.0142(-50)} \approx 54.1$ million

4. Let Q represent a mass of radioactive radium (^{256}Ra) in grams, whose half-life is 1620 years. The quantity of radium present after t years is $Q = 25\left(\frac{1}{2}\right)^{t/1620}$. (a) Determine the initial quantity (when t = 0). (b) Determine the quantity present after 1000 years. (c) Determine the quantity present after 5000 years.

a) $Q = 25\left(\frac{1}{2}\right)^{0/1620} = 25$

b) $Q = 25\left(\frac{1}{2}\right)^{1000/1620} \approx 16.297\text{ g}$

c) $Q = 25\left(\frac{1}{2}\right)^{5000/1620} \approx 2.943\text{g}$

5. Let Q represent a mass of carbon 14 (^{14}C) in grams, whose half-life is 5730 years. The quantity of carbon 14 present after t years is $Q = 10\left(\frac{1}{2}\right)^{t/5730}$. (a) Determine the initial quantity (when t = 0). (b) Determine the quantity present after 1822 years.

a) $Q = 10\left(\frac{1}{2}\right)^{0/5730} = 10$

b) $Q = 10\left(\frac{1}{2}\right)^{1822/5730} \approx 8.022\text{ g}$

6. Let Q represents a mass of plutonium 241 (^{241}Pu) in grams, whose half-life is 13 years. The quantity of plutonium 241 present after t years is $Q = 10\left(\frac{1}{2}\right)^{t/13}$. (a) Determine the initial quantity (when t = 0). (b) Determine the quantity present after 26 years.

a) $Q = 10\left(\frac{1}{2}\right)^{0/13} = 10$

b) $Q = 10\left(\frac{1}{2}\right)^{26/13} = 2.5$