All constants should be expressed rounded to three significant digits to the right of the decimal. Label answers to word problems when appropriate.

**Q1:** A. Using math, explain how you know that the following data can be modeled with an exponential function.

<table>
<thead>
<tr>
<th>$x$</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>5</td>
<td>7</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Look at ratios of successive points.

\[
\frac{f(3)}{f(2)} = \frac{7}{5} = 1.4 \quad \frac{f(4)}{f(3)} = \frac{9.8}{7} = 1.4
\]

Since these are equal, the model is exponential with a growth rate of 1.4.

B. Find the equation of the form $y = bat$ that best describes this data.

\[
y = b \cdot (1.4)^t
\]

To find $b$, use any of the data values $(2, 5)$, $(3, 7)$ or $(4, 9.8)$

$5 = b \cdot (1.4)^2 \Rightarrow 5 = b \cdot (1.96)$

\[
b = \frac{5}{1.96} = 2.551
\]

\[
y = 2.551 \cdot (1.4)^t
\]

**Q2:** If time is measured in years, and $P = 50e^{0.065t}$, what is the

A. annual growth rate $0.672\%$  
B. continuous growth rate $0.065 = 6.5\%$

\[
P = 50e^{0.065t}
\]

\[
p = 50 \cdot e^{0.065} \Rightarrow a = e^{0.065} = 1.0672
\]

**Q3:** A. The half-life of radioactive strontium-90 is 29 years. Find a model for the continuous decay of radioactive strontium-90.

\[
P = P_0 e^{kt}
\]

\[
k = \frac{\ln 0.5}{29} = -0.0239
\]

\[
0.5 = 1 \cdot e^{-29k}
\]

\[
-\ln 0.5 = 29k
\]

B. In 1960, radioactive strontium-90 was released into the atmosphere during testing of nuclear weapons, and was absorbed into people's bones. How many years does it take until only 10% of the original amount remains?

\[
0.16 = e^{-0.0239t}
\]

\[
\ln (0.16) = -0.0239t 
\]

\[
\frac{\ln (0.16)}{-0.0239} = t
\]

\[
t = 96.342\text{ years}
\]
All constants should be expressed rounded to three significant digits to the right of the decimal.

Q1: A. Using math, explain how you know that the following data can be modeled with an exponential function.

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</table>

Look at ratios of successive data points.
\[
\frac{f(3)}{f(2)} = \frac{8}{5} = 1.6 \quad \frac{f(4)}{f(3)} = \frac{12.8}{8} = 1.6
\]
Since these = 1.6, the model is exponential with a growth rate 0.6.

B. Find the equation of the form \( y = ba^t \) that best describes this data.

\[
y = b (1.6)^t
\]
To find \( b \), use any one of the points \((2,5)\), \((3,8)\), \((4,12.8)\)

\[
5 = b (1.6)^2
\]
\[
b = \frac{5}{(1.6)^2} = 1.953
\]

\[
y = 1.953 (1.6)^t
\]

Q2: If time is measured in years, and \( P = 50e^{0.075t} \), what is the

A. annual growth rate \( 0.079 \)

\[
y = 50e^{0.075t}
\]

B. continuous growth rate \( 0.075 \)

\[
a = e^{0.075}
\]
\[
a = 1.07788 = 1.0779
\]

Q3: A. The half-life of radioactive strontium-90 is 29 years. Find a model for the continuous decay of radioactive strontium-90.

\[
P = P_0 e^{kt}
\]
\[
\ln \frac{1}{2} = 29k
\]
\[
\frac{\ln \frac{1}{2}}{29} = k
\]
\[
P = P_0 e^{-0.0239t}
\]

B. In 1960, radioactive strontium-90 was released into the atmosphere during testing of nuclear weapons, and was absorbed into people's bones. How many years does it take until only 10% of the original amount remains?

\[
P = P_0 e^{-0.0239t}
\]
\[
0.1 = 100 e^{-0.0239t}
\]
\[
0.1 = e^{-0.0239t}
\]
\[
\ln (0.1) = -0.0239t
\]
\[
t = \frac{\ln(0.1)}{-0.0239} = 96.342 \text{ years.}
\]
All constants should be expressed rounded to three significant digits to the right of the decimal. Label answers to word problems when appropriate.

**Q1:**

A. Using math, explain how you know that the following data can be modeled with an exponential function.

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B. Find the equation of the form $y = ba^t$ that best describes this data.

**Q2:**

If time is measured in years, and $P = 50e^{0.065t}$, what is the

A. annual growth rate __________  
B. continuous growth rate __________

**Q3:**

A. The half-life of radioactive strontium-90 is 29 years. Find a model for the continuous decay of radioactive strontium-90.

B. In 1960, radioactive strontium-90 was released into the atmosphere during testing of nuclear weapons, and was absorbed into people's bones. How many years does it take for until only 10% of the original amount remains?
All constants should be expressed rounded to three significant digits to the right of the decimal.

Q1:  A. Using math, explain how you know that the following data can be modeled with an exponential function.

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B. Find the equation of the form \( y = b^a^t \) that best describes this data.

Q2:  If time is measured in years, and \( P = 50e^{0.075t} \), what is the

A. annual growth rate__________  B. continuous growth rate__________

Q3:  A. The half-life of radioactive strontium-90 is 29 years. Find a model for the continuous decay of radioactive strontium-90.

B. In 1960, radioactive strontium-90 was released into the atmosphere during testing of nuclear weapons, and was absorbed into people's bones. How many years does it take until only 10% of the original amount remains?