Q1: How long will it take for the US population to double if it continues to grow at a rate of 0.975% per year? Box your answer.

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

\[ r = 0.975\% = 0.00975 \]

Find \( t \)

\[ 2P_0 = P_0 e^{0.00975t} \]
\[ 2 = e^{0.00975t} \]
\[ \ln 2 = \ln e^{0.00975t} \]
\[ \ln 2 = 0.00975t \]
\[ t = \frac{\ln 2}{0.00975} \]
\[ t = 71.09 \text{ years} \]

Q2: Use the derivative formulas 1–5 to find the derivatives of A–D.

1. \( \frac{d}{dx}(x^n) = nx^{n-1} \)

2. \( \frac{d}{dx}(e^x) = e^x \)

3. \( \frac{d}{dx}(\ln x) = \frac{1}{x} \)

4. \( \frac{d}{dx}(b^x) = b^x \cdot \ln b \)

5. \( \frac{d}{dx}(\log_b x) = \frac{1}{x \ln b} \)

A. \( y = e^3 + 3e^x \)

\[ y' = 3e^x \]

B. \( y = x^5 + 5^x \)

\[ y' = 5x^4 + 5^x \cdot \ln 5 \]

C. \( y = \ln(x^3) \) (Hint: Use a rule of logarithms to rewrite \( y \) before taking the derivative)

\[ y = 3 \cdot \ln x \]

\[ y' = 3 \cdot \frac{1}{x} \]

D. \( y = 7 \log(x) \)

\[ y' = 7 \cdot \frac{1}{x \cdot \ln 10} \]

\[ y' = \frac{7}{x \cdot \ln 10} \]
Q1: How long will it take for the US population to double if it continues to grow at a rate of 0.985% per year? Box your answer.

\[ P = P_0 e^{rt} \]
\[ r = .00985 \]  
find \( t \)

\[ 2P_0 = P_0 e^{.00985t} \]
\[ 2 = e^{.00985t} \]
\[ \ln 2 = \ln e^{.00985t} \]
\[ \ln 2 = .00985t \]
\[ t = \frac{\ln 2}{.00985} \]
\[ t = 70.37 \text{ years} \]

Q2: Use the derivative formulas 1 – 5 to find the derivatives of A - D.

1. \( \frac{d}{dx}(x^n) = nx^{n-1} \)
2. \( \frac{d}{dx}(e^x) = e^x \)
3. \( \frac{d}{dx}(\ln x) = \frac{1}{x} \)
4. \( \frac{d}{dx}(b^x) = b^x \cdot \ln b \)
5. \( \frac{d}{dx}(\log_b x) = \frac{1}{x \ln b} \)

A. \( y = x^6 + 6^x \)
\( y' = 6x^5 + 6^x \cdot \ln 6 \)

B. \( y = e^4 + 4e^x \)
\( y' = 0 + 4e^x \)

C. \( y = \log(x) \)
\[ y' = 5 \cdot \frac{1}{x} \cdot \frac{1}{\ln 10} \]
\[ y' = \frac{5}{x \ln 10} \]

D. \( y = \ln(x^4) \) (Hint: Use a rule of logarithms to rewrite \( y \) before taking the derivative)
\[ y = 4 \cdot \ln x \]
\[ y' = \frac{4}{x} \]
Q1: How long will it take for the US population to double if it continues to grow at a rate of 0.975% per year? Box your answer.

Q2: Use the derivative formulas 1 – 5 to find the derivatives of A - D.

1. \( \frac{d}{dx}(x^n) = nx^{n-1} \)
2. \( \frac{d}{dx}(e^x) = e^x \)
3. \( \frac{d}{dx}(\ln x) = \frac{1}{x} \)
4. \( \frac{d}{dx}(b^x) = b^x \cdot \ln b \)
5. \( \frac{d}{dx}(\log_b x) = \frac{1}{x \cdot \ln b} \)

A. \( y = e^3 + 3e^x \)
B. \( y = x^5 + 5^x \)
C. \( y = \ln (x^3) \) (Hint: Use a rule of logarithms to rewrite \( y \) before taking the derivative)
D. \( 7 \log (x) \)
Q1: How long will it take for the US population to double if it continues to grow at a rate of 0.985% per year? Box your answer.

Q2: Use the derivative formulas 1 – 5 to find the derivatives of A - D.

1. \( \frac{d}{dx}(x^n) = nx^{n-1} \)
2. \( \frac{d}{dx}(e^x) = e^x \)
3. \( \frac{d}{dx}(\ln x) = \frac{1}{x} \)
4. \( \frac{d}{dx}(b^x) = b^x \cdot \ln b \)
5. \( \frac{d}{dx}(\log_b x) = \frac{1}{x \cdot \ln b} \)

A. \( y = x^6 + 6^x \)
B. \( y = e^4 + 4e^x \)

C. \( 5 \log (x) \)
D. \( y = \ln (x^4) \) (Hint: Use a rule of logarithms to rewrite \( y \) before taking the derivative)