Work for problem 2(a)

\[ a) \quad p'(9) = 1 - \frac{3}{2}e^{-0.2\sqrt{9}} \]
\[ = -0.646 \text{ gallons/day} \]

No. \( p'(9) \) is negative, so the amount of pollutant is decreasing.

Work for problem 2(b)

\[ b) \quad p'(t) = 1 - 3e^{-0.2t} = 0 \]
\[ t = 30.173 \]

\[ p'(t) \quad \frac{\downarrow}{\text{30.173}} \quad + \]
\[ p(t) \quad \text{minimum at } t = 30.173 \]
Work for problem 2(c)

\[ 50 + \int_{0}^{30.173} p'(t) \, dt \]

\[ = 50 - 14.895 \]

\[ = 35.104 \text{ gallons} \]

At day 30, there will be 35.104 gallons of pollutant left, and 35.104 < 40, 
\therefore it will be safe.

Work for problem 2(d)

\[ p'(0) = 1 - 3e^{-0.2 \cdot 0} \]

\[ = 1 - 3e^0 \]

\[ = 1 - 3 \]

\[ = -2 \]

\[ p(0) = 50 \]

\[ y - 50 = -2(x) \]

\[ y = -2x + 50 \]

\[ -2x + 50 \leq 40 \]

\[ -2x \leq -10 \]

\[ x \geq 5 \]

It predicts that at \[ t = 5 \] the lake will become safe.

GO ON TO THE NEXT PAGE.
Work for problem 2(a)

\[ p'(q) = 1 - 3e^{0.2\sqrt{q}} = -0.646 \text{ gallons/day} \]

The level of pollutant is decreasing because the rate is negative, as it is decreasing.

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Work for problem 2(b)

Gallons of pollutant at a min when \( p'(t) = 0 \)

\[ 1 - 3e^{-0.2t} = 0 \]
\[ 3e^{-0.2t} = 1 \]
\[ e^{-0.2t} = \frac{1}{3} \]
\[ -0.2t = \ln\frac{1}{3} \]
\[ t = \frac{\ln\frac{1}{3}}{-0.2} \]
\[ t = \frac{(\ln\frac{1}{3})^2}{-0.2} \]
\[ t = 30.174 \]
\[ \approx 30 \text{ days} \]
Work for problem 2(c)

\[
\text{no of gallons present at the lake} = 50 + \int_0^{250} (1 - 3e^{-0.25t}) \, dt
\]

\[
= 50 \times 0.000 \text{ gallons.}
\]

the lake is not safe because the no. of gallons is above 40 gallons.

Work for problem 2(d)

slope of tangent = \(1 - 3e^{-0.25t}\)

at \(t=0\); gallons = 50 \(\Rightarrow m_{t=0} = 1 - 3e^{-0.25 \times 0} = 2\)

equation of tangent: \(y = -2x + 50\)

40 lake is safe \(\Rightarrow 40 = -2x + 50\)

\(\Rightarrow -2x = 10\)

\(\Rightarrow x = 5\)

after 5 days.