1) An object moves along the x-axis with its position given by:

\[ x(t) = t + 25 \sin(t), \quad 0 \leq t \leq 2\pi. \]

At what times does it come to a stop?

Stop \iff velocity is zero \iff \frac{dx}{dt} = 0

\[ \frac{dx}{dt} = 1 + 25 \cos t = 0 \]

\[ 25 \cos t = -1 \]

\[ \cos t = -\frac{1}{2} \]

\[ t = \frac{2\pi}{3} + 2n\pi \]

and

\[ t = \frac{4\pi}{3} + 2n\pi \]

Of course, since we're told \(0 \leq t \leq 2\pi\), only

\[ t = \frac{2\pi}{3}, \frac{4\pi}{3} \]

are valid.

(over)
a) If \( y = e^{-5x} \cos(3x) \), find a formula for \( \frac{dy}{dx} \).

Use product rule

\[
\frac{dy}{dx} = \left( e^{-5x} \right) \frac{d}{dx} (\cos 3x) + \frac{d}{dx} (e^{-5x}) (\cos 3x)
\]

Use chain rule

\[
\frac{dy}{dx} = \left( e^{-5x} \right) (-3 \sin 3x) \frac{d}{dx} (3x) + (e^{-5x}) \frac{d}{dx} (-5x) (\cos 3x)
\]

\[
\frac{dy}{dx} = \left( e^{-5x} \right) (-3 \sin 3x) (3) + (e^{-5x}) (-5) (\cos 3x)
\]

\[
\frac{dy}{dx} = -e^{-5x} \left( 9 \sin 3x + 5 \cos 3x \right)
\]