1. (4 points) Find the x-value for each point on the graph of \( f(x) = x^3 + 2.5x^2 - 2x + \ln 3 \), where the tangent line is horizontal.

\[
\text{Slope of tangent line} = \text{derivative} \\
\frac{d}{dx}(x^3 + 2.5x^2 - 2x + \ln 3) = 3x^2 + 5x - 2 \\
= (3x - 1)(x + 2) \\
\]

Tangent line horizontal \( \Rightarrow \) slope = 0

\[
(3x - 1)(x + 2) = 0 \\
3x = 1 \quad \text{or} \quad x = -2 \\
\]

\[
\boxed{x = \frac{1}{3} \quad \text{or} \quad x = -2} \\
\]

2. (2 points) If \( f \) is a differentiable function, find an expression for the derivative of the function \( y = x^3 f(x) \)

\[
y' = (x^3)'f(x) + x^3 f'(x) \quad \text{(Product Rule)} \\
\]

\[
y' = 3x^2 f(x) + x^3 f'(x) \\
\boxed{y'} \\
\]
3. (2 points each) Using Leibniz notation (i.e. \(dy/dx, dP/dt\), etc.), find derivatives for each of the following functions:

(a) \(P = s^6 + e^{-5\ln 2}\)

\[
\frac{dP}{ds} = 6s^5 + 0
\]

(b) \(r = \frac{\pi}{3t^3 - 7t + 1}\)

\[
\frac{dr}{dt} = \frac{0(3t^3 - 7t + 1) - \pi(9t^2 - 7)}{(3t^3 - 7t + 1)^2}
\]

\(= \frac{-\pi(9t^2 - 7)}{(3t^3 - 7t + 1)^2}\)