No calculators allowed.

1. (6 points) Find derivatives of each of the following functions. Use Leibniz notation for the derivative.

(a) \( w = (2q^5 - 4q^2 + 6)^3 \)
\[
\frac{dw}{dq} = 3(2q^5 - 4q^2 + 6)^2 \cdot (10q^4 - 8q)
\]

(b) \( P = 100e^{-0.3t} \)
\[
\frac{dp}{dt} = 100e^{-0.3t} \cdot (-0.3)
\]
\[
\frac{dp}{dt} = -30e^{-0.3t}
\]

(c) \( y = \ln(\sqrt{x^3}) \)

Easy way: \( y = \ln(x^{3/2}) = \frac{3}{2} \ln x \)
\[
\frac{dy}{dx} = \frac{3}{2} \cdot \frac{1}{x} = \frac{3}{2x}
\]

Hard way: \( y = \ln((x^3)^{1/2}) \)
\[
\frac{dy}{dx} = \frac{1}{(x^3)^{1/2}} \cdot \frac{1}{2} (x^3)^{-1/2} \cdot (3x^2) = \frac{3}{2x}
\]
2. (2 points) Find the equation of the line tangent to the graph of \( f(x) = 3e^{2-x} \) at \( x = 2 \). Write your final answer in the form \( y = mx + b \).

\[
f(x) = 3e^{2-x} \quad \text{so} \quad f(2) = 3e^0 = 3
\]

\[\text{POINT: } (2,3)\]

\[
f'(x) = -3e^{2-x} \quad \text{so} \quad f'(2) = -3e^0 = -3
\]

\[\text{SLOPE: } -3\]

\[
y - 3 = -3(x - 2) \Rightarrow y = -3x + 9
\]

3. (2 points) Rick deposits $200 in an account which earns 5% interest compounded continuously. In dollars per year, how quickly will the balance in his account be increasing 20 years later? Round off your answer to 2 places after the decimal. You may use that \( e \approx 2.71828 \).

\[
A(t) = 200e^{0.05t}
\]

\[
A'(t) = 200e^{0.05t} \cdot (0.05)
\]

\[
A'(t) = 10e^{0.05t}
\]

\[
A'(20) = 10e^{0.05(20)}
\]

\[
A'(20) = 10e
\]

\[
A'(20) \approx 10(2.71828)
\]

\[
A'(20) \approx 27.1828
\]

\[\text{27.18 dollars per year}\]