There are 10 points possible. Partial credit may be given where applicable. Solve each of the following problems. Show all of your work. (i.e. \( u = 1-5x \), etc.) If you run out of room, you may use additional sheets of paper. Be aware of problems on the back of the page.

1. (5 pts.) Find an equation for the tangent line to the curve

\[ y = x^3 \]

at the point \((-2, -8)\).

\[ \frac{dy}{dx} = 3x^2 \]

Slope at \((-2, -8)\):

\[ \frac{dy}{dx} \bigg|_{x=-2} = 3(-2)^2 = 12 \]

Equation of line:

\[ y - y_0 = m(x-x_0) \]

\[ y - (-8) = 12(x - (-2)) \]

\[ y + 8 = 12x + 24 \]

\[ y = 12x + 16 \]
2. (5 pts.) Find the derivative of

\[ f(x) = x^2 - 4x \]

using the definition of derivative. You will receive zero points for using the power rule on this problem.

\[
\begin{align*}
f'(x) &= \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \\
&= \lim_{h \to 0} \frac{(x+h)^2 - 4(x+h) - (x^2 - 4x)}{h} \\
&= \lim_{h \to 0} \frac{x^2 + 2hx + h^2 - 4x - 4h - x^2 + 4x}{h} \\
&= \lim_{h \to 0} \frac{2hx + h^2 - 4h}{h} \\
&= \lim_{h \to 0} \frac{h(2x + h - 4)}{h} \\
&= \lim_{h \to 0} (2x + h - 4) \\
&= 2x - 4.
\end{align*}
\]