1. (10 pts; p 132 #7) Use the limit definition of the derivative to find \( f'(2) \) for the function \( f(x) = 3x^2 - 5x \). Then use \( f'(2) \) to find the equation of the line tangent to the parabola \( y = 3x^2 - 5x \) at the point \((2, 2)\).

**Solution:** The derivative of \( f(x) = 3x^2 - 5x \) at \( x = 2 \) will give the slope of the tangent line.

\[
f'(2) = \lim_{h \to 0} \frac{f(2 + h) - f(2)}{h} = \lim_{h \to 0} \frac{[3(2 + h)^2 - 5(2 + h)] - [3(2)^2 - 5(2)]}{h}
\]

4/10 points for this step

\[
= \lim_{h \to 0} \frac{3(4 + 4h + h^2) - 10 - 5h - 12 + 10}{h} = \lim_{h \to 0} \frac{12h + 3h^2 - 5h}{h} = \lim_{h \to 0} \frac{7h + 3h^2}{h}
\]

\[
= \lim_{h \to 0} h(7 + 3h) = \lim_{h \to 0} 7 + 3h = 7
\]

To find the tangent line, use the point-slope form of the equation of a line: \( y = m(x - a) + b \). We were given \( a = 2, b = 2 \), and now we have found \( m = 7 \). The equation of the tangent line is \( y = 7(x - 2) + 2 \).

2. (10 pts; p 144 #25) Use the limit definition of the derivative to find the derivative \( g'(x) \) of the function \( g(x) = \sqrt{1 + 2x} \).

\[
f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} = \lim_{h \to 0} \frac{\sqrt{1 + 2(x + h)} - \sqrt{1 + 2x}}{h}
\]

4/10 points for this step

\[
= \lim_{h \to 0} \frac{(\sqrt{1 + 2x + 2h} - \sqrt{1 + 2x})(\sqrt{1 + 2x + 2h} + \sqrt{1 + 2x})}{h(\sqrt{1 + 2x + 2h} + \sqrt{1 + 2x})}
\]

\[
= \lim_{h \to 0} \frac{1 + 2x + 2h - (1 + 2x)}{h(\sqrt{1 + 2x + 2h} + \sqrt{1 + 2x})} = \lim_{h \to 0} \frac{2h}{h(\sqrt{1 + 2x + 2h} + \sqrt{1 + 2x})}
\]

\[
= \lim_{h \to 0} \frac{2}{\sqrt{1 + 2x + 2h} + \sqrt{1 + 2x}} = \frac{2}{2\sqrt{1 + 2x}} = \frac{1}{\sqrt{1 + 2x}}
\]