1. Determine the given limit:

\[
\begin{array}{ccc}
\lim_{x \to 2} \frac{x^2 - 3x + 2}{x - 2} & \quad & \lim_{x \to 2} \frac{|x^2 - 3x + 2|}{x - 2} & \quad & \lim_{x \to 2} \frac{\sqrt{x^2 - 2} - 2}{x - 2} \\
\lim_{x \to 0} \frac{25x - 1}{x} & \quad & \lim_{x \to 0} \frac{e^x - 1}{x} & \quad & \lim_{h \to 0} \frac{e^{h+2}(2^h - 1)}{h} \\
\lim_{x \to 1} \frac{\ln x}{\cos (\pi x)} & \quad & \lim_{h \to 0} \frac{\frac{4}{1+h} - 4}{h} & \quad & \lim_{h \to 0} \frac{(3 + h)^2 - 9}{h}
\end{array}
\]

2. The velocity, \( v \), of a skydiver is given by

\[ v(t) = \frac{mg}{k} \left( 1 - e^{-kt/m} \right) \]

Where \( t \) is in seconds, \( m \) is mass of parachutist, and \( g \) is acceleration due to gravity.

(a) What is the skydiver’s terminal velocity? That is, in terms of the constants in the problem, what is \( \lim_{t \to \infty} v(t) \)?

(b) Suppose you are a skydiver weighing \( mg = 150 \) lb and that in the first 10 seconds you reach 80% of your terminal velocity.

Find \( m= \) ______________________ and find \( k= \) ______________________
3. Using the limit definition of $f'(a)$ which is $f'(a) = \lim_{h \to 0} \frac{f(a + h) - f(a)}{h}$, determine the derivative of $f(x)$ at $x = a$ for $f(x) = x^2 - 5x + 1$.

(a) Using your answer above, what is $f'(4)$? 
(b) What is the equation of the tangent line at $x = 4$?
(c) Using your answer above, what is $f'(-5)$?
(d) What is the equation of the tangent line at $x = -5$?
(e) Using your answer above, at what value of $x$ is the vertex?
(f) What is the equation of the tangent line at the vertex?

4. Given the sketch of the $f'(x)$ given the graph of $f(x)$ below:

![Graph of f(x) and f'(x)]

5. Given the function: $f(x) = \begin{cases} 
4x - 1 & x \leq 3 \\
3x + 2 & x > 3 
\end{cases}$

(a) Is the function $f$ differentiable at $x = 3$?
(b) Why is it or is it not differentiable at $x = 3$?