Discussion Problems 3 (Tue., Oct. 20)

1. Assume \( x \neq 0 \). Compute (any way is fine): \( \lim_{h \to 0} \frac{\frac{1}{(x+h)^5} - \frac{1}{x^5}}{h} \)

2. Let 
\[
f(x) = \begin{cases} 
\frac{1}{2} x + \frac{5}{2} & x < 1 \\
2 + \sqrt{x} & x \geq 1
\end{cases}
\]
(a) Determine for which \( x \) the function is continuous.
(b) Determine for which \( x \) the function is differentiable.

3. Let 
\[
f(x) = x|x| + |x - 1|
\]
(a) Determine for which \( x \) the function is continuous.
(b) Determine for which \( x \) the function is differentiable.

4. Let 
\[
f(x) = 4x + 6\sqrt{x}
\]
(a) Determine the equation of the tangent line to the graph of \( y = f(x) \) at \( x = 1 \).
(b) Determine points on the graph of \( y = f(x) \) at which the tangent is parallel to the line \( y = 3x + 17 \).