Num. _____**Name.** _____

Find

(1)(10%)

$\lim_{x\to 2^+} \frac{x^2-x-2}{x-2}$

(2)(10%)

$\lim_{x\to 0} \frac{\tan 2x}{3x}$

(3) (10%)

$$f(x) = \begin{cases} kx+1 & \text{if } x \le 2 \\ kx^2-3 & \text{if } x > 2. \end{cases}$$

Find the value of k that will make f continuous at $(-\infty, \infty)$

(4)(10%)

If $h(t) = (t^2+1)\sin t$, then find h''

(5)(15%)

Let $f(x) = \frac{1}{x+1}$. Find

(a) the slope of the secant line passing through the points $(1, f(1))$ and $(1+h, f(1+h))$

(b) the slope of the tangent line passing through the point $(1, \frac{1}{2})$

(c) an equation of the tangent line passing through the point $(1, \frac{1}{2})$

(6)(15%)

If $h(x) = \frac{f(x)g(x)}{f(x)-g(x)}$, $f(1) = 2$, $f'(1) = -1$, $g(1) = -2$, $g'(1) = 3$, then find $h'(1)$.

(7)(15%)

Find an equation of the tangent line at the point on the graph of $y = x^2 \sin 3x$, when $x = \frac{\pi}{2}$.

(8)(15%)

Find an equation of the tangent line to the graph of

$$4x^4 + 8x^2y^2 - 25x^2y + 4y^4 = 0$$

at the point $(2, 1)$.