MAT1475 Calculus I **Review for Exam 1**

1. Evaluate the given limits

$(a).\ \lim_{x\to\frac{\pi}{2}} \sin x \cos x$ $(b).\ \lim_{x\to 0} \ln(1+x)$ $(c).\ \lim_{x\to 0}(e^{2x}+1)$

$(d).\ \lim_{x\to 0} \dfrac{x^2+2x}{x^2-2x}$ $(e).\ \lim_{x\to 1} \dfrac{x^2-2x+1}{2x^2-x-1}$ $(f).\ \lim_{h\to 0} \dfrac{(2+h)^2-4}{h}$

$(g).\ \lim_{x\to 9} \dfrac{\sqrt{x}-3}{x-9}$ $(h)\ \lim_{x\to 1} \dfrac{\frac{1}{x}-1}{x-1}$

2. Evaluate the limits of the piecewise defined functions and answer the question.

$$g(x) = \begin{cases} 2x^2+5x-1, & \text{if } x<0 \\ \sin x, & \text{if } x\geq 0 \end{cases}$$

$(a).\ \lim_{x\to 0^-} g(x)$ $(b).\ \lim_{x\to 0^+} g(x)$ $(c).\ \lim_{x\to 0} g(x)$ $(d).\ g(0).$

$(e).$ Is $g(x)$ continuous at $x=0$? If not, explain the type of the discontinuity.

3. Evaluate the limits of the piecewise defined functions and answer the question.

$$f(x) = \begin{cases} x^2, & x<2 \\ x+1, & x=2 \\ -x^2+2x+4, & x>2 \end{cases}$$

$(a).\ \lim_{x\to 2^-} f(x)$ $(b).\ \lim_{x\to 2^+} f(x)$ $(c).\ \lim_{x\to 2} f(x)$ $(d).\ f(2).$

$(e).$ Is $f(x)$ continuous at $x=2$? If not, explain the type of the discontinuity.

4. Let $f(x) = -3x^2+2x-1$
   $(a).$ Using the definition of the derivative to compute $f'(x)$.
   $(b).$ Find the equation of the tangent line to the graph of f at $x=1$.

5. Use differential rules to find the derivative of the following functions.

$(a).\ f(x) = x^7+10$ $(b).\ f(x) = 4x^2-7x$ $(c).\ f(x) = x^4+\dfrac{2}{x}$

$(d).\ f(x) = (x+2)(2x^2-3)$ $(e).\ f(x) = \dfrac{x^3+2x^2-4}{3}$ $(f).\ f(x) = \dfrac{x^2+4}{x^2-4}$