

Review Sheet / Calculus I - Exam 1

1. Let $f(x) = \cot x$ and $g(x) = \frac{1}{x}$. Find: a) the domain of f
 b) $(f-g)(\pi/2)$ c) $(g \circ f)(x)$

2. Find the following limits. Be as specific as possible with your answers.
 a) $\lim_{x \rightarrow -2} \frac{x^2 - 4}{x + 2}$ b) $\lim_{x \rightarrow 3^-} \frac{x^2}{x^2 - 9}$ c) $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1}$

d) $\lim_{t \rightarrow \infty} \frac{t^2 - 2t + 3}{7 + 5t - 2t^2}$ e) $\lim_{x \rightarrow -\infty} \frac{\sqrt{x^2 + 1}}{2x}$ f) $\lim_{x \rightarrow 0^-} \cot x$

3. Let $f(x) = \begin{cases} \frac{1}{2} - \frac{1}{2}x, & x \leq -1 \\ x^2, & x > -1 \end{cases}$

a) Find $\lim_{x \rightarrow -1^-} f(x)$.

b) Find $\lim_{x \rightarrow -1^+} f(x)$.

c) Does $\lim_{x \rightarrow -1} f(x)$ exist? If so, what is its value? If not, explain.

d) Is f continuous at $x = -1$? Justify your answer using the definition of continuity.

4. Use the definition $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ (provided the limit exist) to find $f'(x)$ where $f(x) = 2 - 5x^2$.

5. An object moves along a straight line so that after t seconds its distance from the origin is $s = \sqrt{t}$ feet.

a) Find the average velocity of the object over the interval $[1, 9]$.

b) Find the velocity of the object at $t = 9$.

6. Let $y = 2x^3$.

a) Find the average rate of change of y wrt x when $x \in [1, 2]$.

b) Find the rate of change of y wrt x when $x = 1$.

c) Find the slope of the tangent line to the curve where $x = 1$.

d) Find the equation of the tangent line to the curve where $x = 1$.

e) Find $\left. \frac{dy}{dx} \right|_{x=2}$.

7. Find y' . a) $y = x - 6\sqrt{x} + \frac{3}{x}$

b) $y = 5e^x + 2x^4 - 10$

c) $y = \sqrt[3]{x^2} - \frac{2\sqrt{x}}{x}$