

This is meant to be a rough sampling of the type of questions that may be on your exam. Please work through these during the next couple of days. We will go over the questions on Wed Sept 28th. Do not use calculators, as you will not be able to use them on the exam.

GOOD LUCK !

1. Let $f(x)$ and $g(x)$ be functions where $f(1) = 1$, $f'(1) = -2$, $g(1) = 3$, and $g'(1) = 1$.
If $h(x) = f(x)g(x)$, calculate $h'(1)$.
2. Find the slope of the line tangent to $y = x^3 + 2x - \frac{1}{x}$ at $x = 1$.
3. Find the vector projection of $[1, 1]$ onto $[-2, 1]$.
4. Consider $f(x) = x^4 - 3x - 4$. Show there is some c for which $f(c) = 1$.
5. Find all vertical and horizontal asymptotes of $y = \frac{x^2 - 2x - 3}{3x^2 - 4x + 1}$.
6. Consider $f(x) = \frac{2}{6x + 1}$. Calculate $f'(2)$ using only the definition of the derivative.
7. Find the equation of the line tangent to $f(x) = x^2 + \sqrt{x}$ at $(1, 2)$.
8. Consider a triangle whose vertices are $A(0, 0)$, $B(2, 1)$ and $C(1, 2)$. Choose the line segment \overline{AB} to be the base of the triangle. Find the vector equation of a line containing the altitude.
9. Find $\lim_{x \rightarrow 0} (\sin x) \left(\sin \frac{1}{x} \right)$. Justify your answer!!
10. Calculate $\lim_{x \rightarrow 1} \frac{x^3 + 2x^2 - 4x + 1}{x^2 - 2x + 1}$.
11. Calculate $\lim_{x \rightarrow 3} \frac{\sqrt{x} - \sqrt{3}}{x^2 - 9}$.
12. Find eqns of both lines through $(2, -3)$ and tangent to $y = x^2 + x$.
13. Find m, b such that $f(x) = \begin{cases} x^2 & x \leq 2 \\ mx + b & x > 2 \end{cases}$ is differentiable.
14. Find $\lim_{x \rightarrow 0} x \cos \left(\frac{1}{x} \right)$. Justify your answer!!
15. Given $f(2) = f'(2) = 3$ find $\lim_{x \rightarrow 2} \left(\frac{f(x)^2 - 9}{x - 2} \right)$.