

No calculators or computers.

1. State the limit definition of the derivative. (5 points)
2. Use the definition of the derivative to compute $f'(-1)$ where $f(x) = 3x^2 + 2x - 1$. (10 points)
3. Evaluate the following limits. (7.5 points each)

(a) $\lim_{x \rightarrow \infty} \frac{3x^3 - 2x + 1}{3x^4 + 4x^2 - 7}$

(b) $\lim_{x \rightarrow 3^-} \frac{x^2 - 2x + 1}{x^2 - x - 6}$

4. Find an equation for the line tangent to the graph of $f(x) = \sin(x/6)$ at the point where $x = \pi$. (10 points)
5. Compute derivatives of the following. (10 points each)

(a) $f(x) = \sqrt[3]{x^2} + (x + 2)^6 e^x$

(b) $g(t) = \frac{2t^2 - 3t}{5 - t^3} + \ln 2$

(c) $h(y) = \cos(y^2 + 1) - \arctan y$

6. Given $x^2 + y^2 = 5xy$, compute dy/dx . (10 points)

7. Antiderivatives. (10 points each)

(a) If $f'(x) = \frac{1}{x^2} + \sec^2(3x)$, what is a possible function for $f(x)$?

(b) If $g'(t) = e^{2t} + \frac{1}{t^2 + 1} + 5$, what is a possible function for $g(t)$?