

No calculators or computers.

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

(a) $\lim_{x \rightarrow 3^-} \frac{x}{x^2 - 9}$

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

4. Find an equation for the line tangent to the graph of $f(x) = \frac{1}{2x}$ at the point where $x = 3$. (10 points)
5. Compute derivatives of the following. (10 points each)

(a) $f(x) = \sqrt[4]{x} + \sin x \cos x + \ln 2$

(b) $g(t) = \frac{5t^8}{\tan t} + \arctan t + \sqrt{\pi}$

(c) $h(y) = e^{-3y} + 5 \ln y - \cos y^2$

6. Given $(3 + y)^{10} = xy$, compute dy/dx in terms of x and y . (10 points)

7. Find antiderivatives for each of the following. (10 points each)

(a) $f(x) = \frac{1}{x^2} + \frac{2}{1+x^2} + \frac{1}{2}$

(b) $g(x) = \frac{5}{x} - e^{x/3} + \pi^2$