

Calculators are not allowed on this exam. Please show your work and be as neat as possible.

1. [5 points] State the definition of $f'(x)$.
2. [10 points] Use the definition of the derivative to compute $f'(-3)$ when $f(x) = \frac{2}{x}$.

3. [7.5 points each] Evaluate the following limits:

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

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

4. [10 points] Find the equation of the line tangent to the graph of $g(x) = \sqrt{6-x}$ at the point where $x = 2$.

5. [10 points each] Compute derivatives of the following:

a) $f(x) = 3 \arctan x + \frac{2x-3}{3x+2} - e^\pi$

b) $g(x) = \cos(2-x) - \ln(x^4) + \sqrt[3]{3x^2-8}$

c) $h(x) = 5^x + \frac{x^3 - 5x}{x^2} + x^3 \sin x$

6. [10 points] Given $x^3 - 5xy^2 = 3e^y$, compute $\frac{dy}{dx}$ in terms of x and y .

7. [10 points each] Find antiderivatives for each of the following:

a) $p(x) = 4 - \cos(2x) + e^{-3x}$

b) $q(x) = \frac{x}{\sqrt{x}} + \frac{1}{2x} - 9x$