

Name: _____

Student Number: _____

CALCULUS I, FALL 2001
JUSTIFY YOUR ANSWERS!!

(1) Find the derivatives of the following functions:

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

(b) $f(x) = \frac{x^6 + x^2}{x}$

(c) $f(x) = (x + 1)^2$

(d) $f(x) = x^3 e^x$

(e) $f(x) = \frac{x^3 + \sqrt{x}}{e^x}$

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

(2) Given the graph of the function $y = f(x)$ below, estimate (or state DNE) :

(a) $\lim_{x \rightarrow -2} f(x) =$

(b) $\lim_{x \rightarrow -1} f(x) =$

(c) $f'(-1)$

(d) $f'(2)$

(e) State where the function $y = f(x)$ is NOT continuous.

(3) Find the equation of the tangent line to the graph of the function $y = 3x^5 + 2x + \sqrt[4]{x}$ at $x = 1$.

(4) **Use the definition of the derivative** to show that $(\sqrt{x})' = \frac{1}{2\sqrt{x}}$.

(5) Evaluate the following limits, or state DNE:

(a) $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2} =$

(b) $\lim_{x \rightarrow \infty} \frac{-x^3 + 3x^2 + 5}{2x^3 + 7x + 700} =$

(6) (a) Find the linear approximation of the function $y = f(x) = e^x$ at the point $a = 0$.

(b) Use this linear approximation to find an approximate solution to the equation $e^x = 100x$.

(7) Given the graph of the function $y = f(x)$ below, draw a reasonable graph of its **anti-derivative**.