

Math 1A Fall 2001: First Math 1A Exam, Fall 1999

(1) a) Let $f(x) = x^2 + 2x$. What is the domain of f ?

b) Find the equation of the tangent line at $x = 2$ using the definition of the derivative.

(2) Let $h(x) = \begin{cases} 3x - 2, & x \leq 0 \\ x^2 - 2, & x > 0 \end{cases}$

(a) Sketch the graph of h .

(b) Find $\lim_{x \rightarrow 0} h(x)$ if it exists.

(c) Is h continuous? Why or why not?

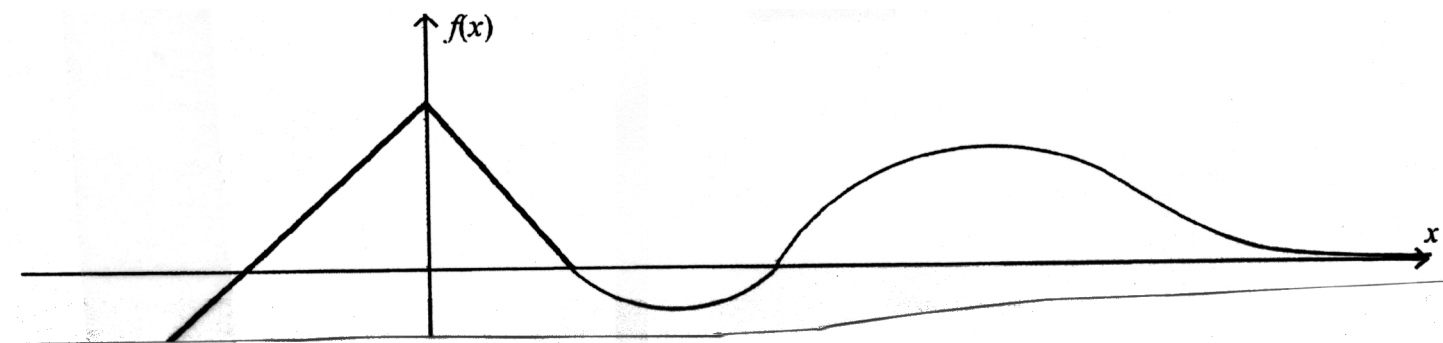
(d) Is h differentiable at $x = 0$? Why or why not?

(3) A particle moves with displacement $s(t) = 16(1 - \frac{1}{t+1})$ meters.

(a) Find the average velocity from $t = 1$ to $t = 3$.

(b) Find the instantaneous velocity at $t = 3$.

4) Given the graph of the function $y = f(x)$ as shown, graph its first and second derivatives on the given axes, marking all noteworthy points appropriately.



(5) Find derivatives of the following functions using any method.

(a) $f(x) = \frac{1}{\sqrt{x}}((\sqrt{x})^5 + 1)$

(b) $f(x) = x^3 \cos 5x$

(c) $f(x) = \frac{\sin x}{3x + 2}$

(6) Find the equation of the tangent line to the curve $x^2y + 2y^3 = 3x + 2y + 54$ at the point where $(x, y) = (2, 3)$.

7) Given that the side length of a cube is known to be 8 centimeters with a possible error of $\pm 2\%$, use linear approximation to estimate the percentage error in the surface area of the cube.