

**AP FRQ Review: Limits/Continuity**

1) Non-Calculator

Let  $f$  be a function defined by  $f(x) = \begin{cases} 1 - 2\sin x & \text{for } x \leq 0 \\ e^{-4x} & \text{for } x > 0. \end{cases}$

- (a) Show that  $f$  is continuous at  $x = 0$ .
- (b) For  $x \neq 0$ , express  $f'(x)$  as a piecewise-defined function. Find the value of  $x$  for which  $f'(x) = -3$ .
- (c) Find the average value of  $f$  on the interval  $[-1, 1]$ .

2) Non-Calculator

The function  $f$  is defined by  $f(x) = \sqrt{25 - x^2}$  for  $-5 \leq x \leq 5$ .

(a) Find  $f'(x)$ .

(b) Write an equation for the line tangent to the graph of  $f$  at  $x = -3$ .

(c) Let  $g$  be the function defined by  $g(x) = \begin{cases} f(x) & \text{for } -5 \leq x \leq -3 \\ x + 7 & \text{for } -3 < x \leq 5. \end{cases}$

Is  $g$  continuous at  $x = -3$ ? Use the definition of continuity to explain your answer.

(d) Find the value of  $\int_0^5 x\sqrt{25 - x^2} dx$ .