

**Mathematics 210-2, MIDTERM I, January 29, 2002**

1. (5 points) Find an equation of the line containing the pair of points  $(-1, 0)$  and  $(1, 1)$ .

2. (10 points) Determine the domain of the function  $f(x) = \frac{x^3}{\sqrt{2x-3}}$ .

Write the answer in interval notation.

3. (10 points) Given  $f(x) = \begin{cases} x^2 + 1, & \text{if } x \geq 1; \\ 2, & \text{if } x < 1. \end{cases}$

Find  $\lim_{x \rightarrow 1^-} f(x)$ ,  $\lim_{x \rightarrow 1^+} f(x)$ ,  $\lim_{x \rightarrow 1} f(x)$ , and  $f(1)$ . Is  $f(x)$  continuous at  $x = 1$  ?

4. (10 points) Find the limit, if it exists:  $\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - 4}$ .

5. (10 points) Using the definition of the derivative, find  $f'(1)$  where  $f(x) = 5x^2 - x$ .

6. (10 points) Find  $f'(x)$  if  $f(x) = x^{-3/4} - 3x^{2/4} + \sqrt{x^5} + 2/x^4$ . Do not simplify the answer.

7. (10 points) Find the points  $(x, y)$  on the graph of  $y = -x^3 + .5x^2 + 8$  at which the tangent line is horizontal.

8. (15 points) A car travels in such a way that distance  $s$  (in miles) from the starting point is given by the formula

$$s(t) = \frac{t^2 + 2t}{t + 1},$$

where  $t$  is time (in minutes).

(a) Find the average velocity on the time interval  $[0, 4]$ .

(b) Find the (instantaneous) velocity when  $t = 0$ .

9. (10 points) Given  $y = x^3 - \frac{3}{x}$  find  $\frac{d^2y}{dx^2}$ .

10. (10 points) The total cost of producing  $x$  units of a product and the total revenue from the sale of them are given by the formulae:  $C(x) = .001x^3 + 1.2x + 60$  and  $R(x) = 50x$ . Find the marginal profit  $P'(x)$ .