

Name and SSN: \_\_\_\_\_

Sample

M 408C

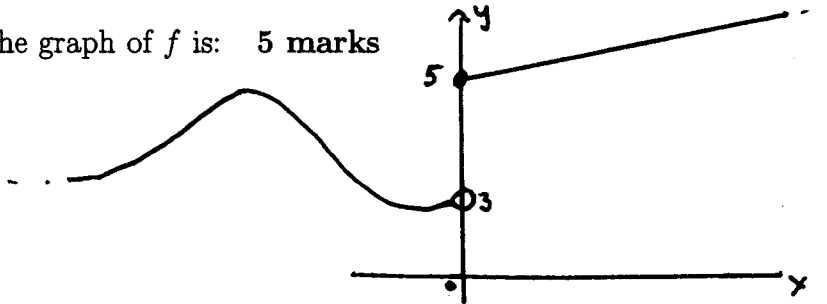
Exam 1

Reid Fall 03

1. Which of the following are continuous at  $x = 0$ . Give reasons for your answers. If discontinuous say whether the discontinuity is removable, jump or neither.

(i)  $f(x) = \frac{x^2 + 2x - 5}{3 + \cos^2 x}$  5 marks

(ii) The graph of  $f$  is: 5 marks



(iii)  $f(x) = \begin{cases} x^2 - 4 & x < 0 \\ 3 & x = 0 \\ x - 4 & x > 0. \end{cases}$  5 marks

(iv)  $f(x) = \begin{cases} 1 - x & x \geq 0 \\ 1/x & x < 0. \end{cases}$  5 marks

2. Let  $f(x) = \frac{x}{x^2+3}$

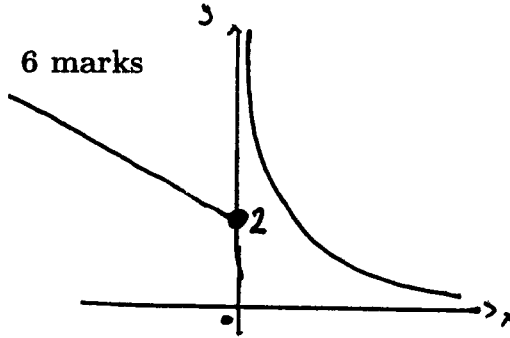
(a) Find the equation of the tangent line to the graph of  $f$  when  $x = -1$ . **8 marks**

(b) Find those points on the graph of  $f$  where the tangent line is horizontal. **7 marks**

3. Do the following limits exist? If so evaluate them.

(a)  $\lim_{x \rightarrow 0} \frac{7 \tan 5x}{2x^2 - 4x}$ . **8 marks**

(b)  $\lim_{x \rightarrow 0} h(x)$  where the graph of  $h$  is: **6 marks**



(c)  $\lim_{x \rightarrow 3} \frac{\sqrt{x^2 - 3}}{x - 2}$ . **6 marks**

4. Let  $f(x) = \frac{2}{x+3}$ . Compute  $f'(-2)$  from first principles (ie using the difference quotient). **12 marks**

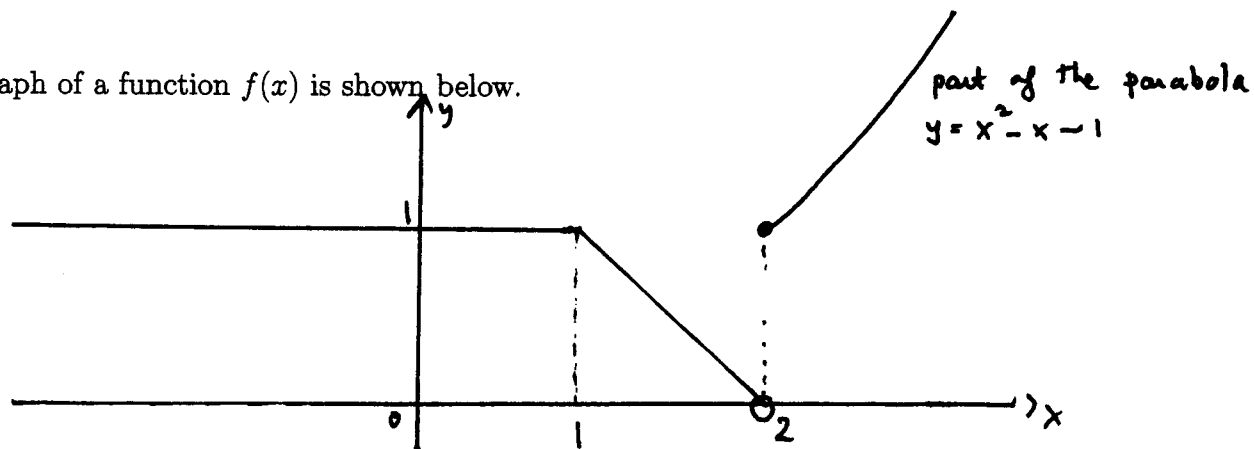
5. Compute the derivatives (no need to simplify):

(a)  $f(x) = \frac{x^5 - 4x^3 + 1}{x^4 - 20x^2}$ . 5 marks

(b)  $f(x) = \sin\left(\frac{1}{x^2+3}\right)$  5 marks

6. Let  $f(x) = \frac{2\cos x}{x^2-1}$  and  $g(x) = (x^2 + \pi)$ . Find  $(f \circ g)'(x)$  when  $x = \sqrt{\pi}$ . **11 marks**

7. The graph of a function  $f(x)$  is shown below.



(a) Determine those points where  $f$  is not differentiable. You must explain your answers.  
**7 marks**

(b) Sketch the graph of  $f'(x)$ . **5 marks**