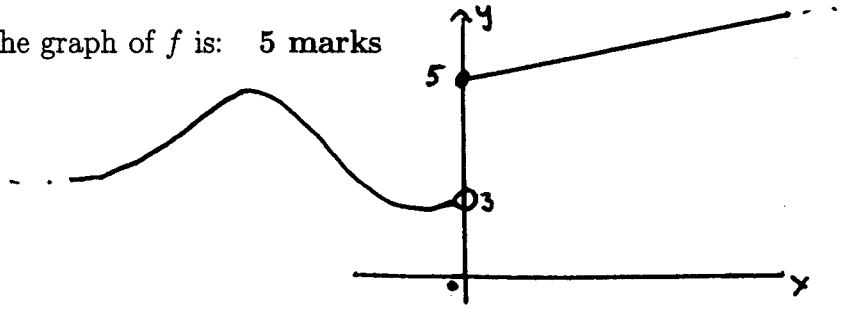
Name and SSN: Sample

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

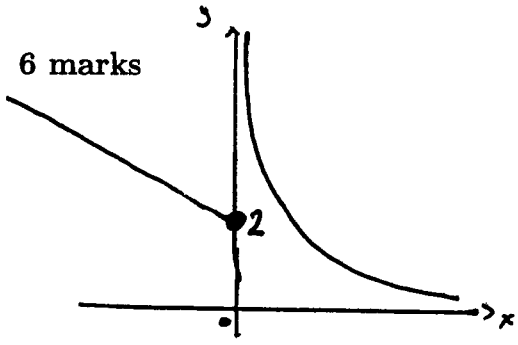
(a) Find the equation of the tangent line to the graph of f when $x = -1$. **8 marks**

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

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



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

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

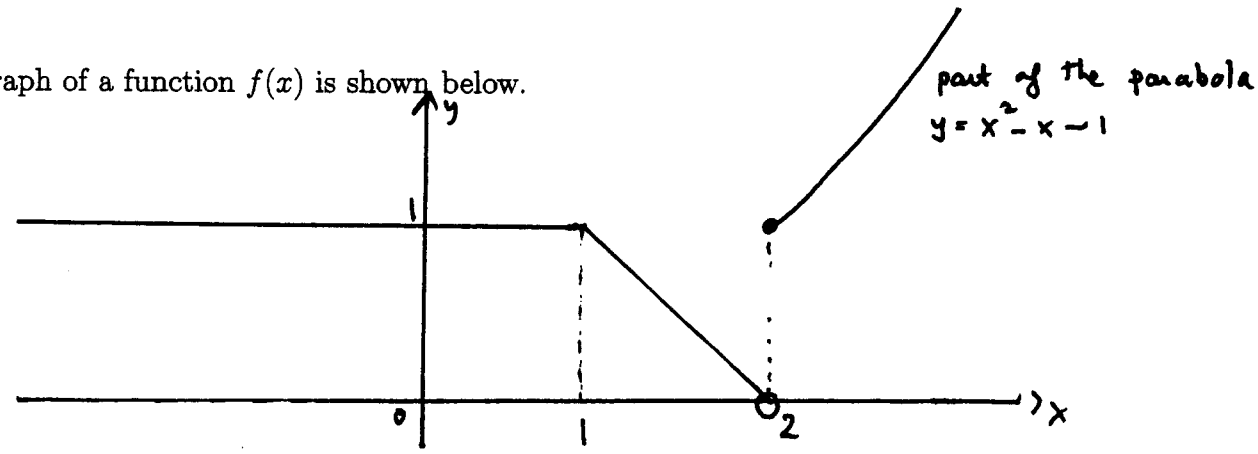
5. Compute the derivatives (**no need to simplify**):

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

(b) $f(x) = \sin(\frac{1}{x^2+3})$ **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**