

Name: \_\_\_\_\_

1. [4 marks] State the values of  $x$  for which the functions below are continuous:

a)  $f(x) = \frac{6}{2x-17}$  \_\_\_\_\_

b)  $f(x) = \begin{cases} x - 1, & x \leq -3 \\ 3x^2, & -3 < x < -1 \\ 4 + x, & x \geq -1 \end{cases}$  \_\_\_\_\_

2. [3 marks] Evaluate the following limit:  $\lim_{x \rightarrow -1} \frac{x^2-1}{x^2-3x-4}$

3. [3 marks] Find  $f'(2)$  for  $f(x) = 5x^4 - 16x^3 + x^2$ .

4. [4 marks] An object's displacement (in metres) is given by  $s(t) = t^4 + 7t^3 + 1$ , where  $t$  is measured in seconds. Find the acceleration of the object. Include correct units.

5. [4 marks] An object's displacement (in metres) is given by  $s(t) = s_0 + v_0t - 4.9t^2$ , where  $t$  is measured in seconds;  $s_0$  and  $v_0$  are constants.

a) Find the object's velocity at  $t = 3$  seconds.

b) Find the time at which the object's velocity is zero.

6. [8 marks] Differentiate with respect to the given variable:

a)  $h(v) = \frac{3v^2+4}{2v+1}$

b)  $u(r) = (r^3 + 1)(6r^2 - 2)$

7. [4 marks] Use the **definition** of the derivative to find  $f'(x)$  for  $f(x) = 5x^2 + \frac{2}{x}$ .