whether they are  $+\infty$ ,  $-\infty$  or undefined.

## 1D-1 Calculate the following limits if they exist. If they do not exist, then indicate

1. Differentiation

a)  $\lim_{x\to 0} \frac{4}{x-1}$  b)  $\lim_{x\to 2} \frac{4x}{x+1}$  c)  $\lim_{x\to -2} \frac{4x^2}{x+2}$  d)  $\lim_{x\to 2^+} \frac{4x^2}{2-x}$  e)  $\lim_{x\to 2^-} \frac{4x^2}{2-x}$  f)  $\lim_{x\to \infty} \frac{4x^2}{x-2}$  g)  $\lim_{x\to \infty} \frac{4x^2}{x-2} - 4x$  i)  $\lim_{x\to \infty} \frac{x^2+2x+3}{3x^2-2x+4}$  j)  $\lim_{x\to 2} \frac{x-2}{r^2-4}$ 

## 1D-2 For which of the following should one use the one-sided limit? Evaluate it.

a)  $\lim_{x \to 0} \sqrt{x}$  b)  $\lim_{x \to 1} \frac{1}{x - 1}$  c)  $\lim_{x \to 1} \frac{1}{(x - 1)^4}$  d)  $\lim_{x \to 0} |\sin x|$  e)  $\lim_{x \to 0} \frac{|x|}{x}$ 

## 1D-3 Identify and give the type of the points of discontinuity of each of the following:

c)  $\frac{x^4}{x^3}$  d)  $f(x) = \begin{cases} x+a, & x > 0 \\ a-x, & x < 0 \end{cases}$ 

e) f'(x), for the f(x) in d) f)  $(f(x))^2$ , where  $f(x) = \frac{d}{dx}|x|$ 

**1D-4** Graph the following functions. a)  $\frac{4x^2}{x-2}$  (See **1D-1**efg.) b)  $\frac{1}{x^2+2x+2}$ 

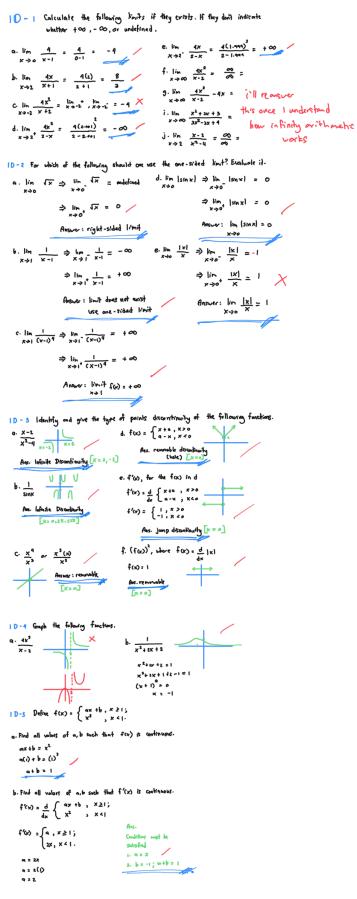
**1D-5** Define  $f(x) = \begin{cases} ax + b, & x \ge 1; \\ x^2, & x < 1. \end{cases}$ 

a) Find all values of a, b such that f(x) is continuous.

b) Find all values of a, b such that f'(x) is continuous. (Be careful!)

## **1D-6** For each of the following functions, find all values of the constants a and b for which the function is differentiable.

a)  $f(x) = \begin{cases} x^2 + 4x + 1, & x \ge 0; \\ ax + b, & x < 0. \end{cases}$  b)  $f(x) = \begin{cases} x^2 + 4x + 1, & x \ge 1; \\ ax + b, & x < 1. \end{cases}$ 



```
1 D - 6 Find all values of the constants a and b for which the function
        is differentiable.
                                    x2 + 4x +1 = 4x +b
a.fe) = { x2 +4x +1, x ≥0;
ax +b , x <0.
                                   (0)2 +4(0) +1 = a(0) + p
                                           b=1, or it any real no.
                                  (1)2 + 4(1)+1 = a(1)+b
                                    1 4 4 4 1 = 4 4 5
                                       9+b = 6
   Comment: Reanswer this
           part, match the Sub-sided stopes of
                                 f(x)
```