

## Lab 7

### Topic: Differentiability at a point.

Use Maple V to graph each of the following, and use your graph, keeping in mind the limitations of any graphing software, to determine if the function is differentiable at the given points. For each answer of "not differentiable", give a reason.

(i)  $\text{abs}(2+3*x)$ ,  $a = -1$ ,  $a = -2/3$ ,  $a = 0$ .

(ii)  $\text{signum}(1-x)$ ,  $a = -2$ ,  $a = 1$ ,  $a = 2$ .

(iv)  $\text{ceil}(x)$ ,  $a = 1/2$ ,  $a = 1$ ,  $a = 3/2$ .

(v)  $\text{floor}(x^2)$ ,  $a = 1$ ,  $a = \text{sqrt}(2)$ ,  $a = 1.732$ .

(vi)  $f(x) = x$ , if  $x \leq 0$ ,  
       $= x^2$ , if  $x > 0$ ,  
at  $a = -1$ ,  $a = 0$ ,  $a = 1$ .

(vii)  $f(x) = x$ , if  $x < 0$ ,  
       $= x^2$ , if  $x > 0$ ,  
at  $a = -1$ ,  $a = 0$ ,  $a = 1$ .

(viii)  $f(x) = x$ , if  $x < 0$ ,  
       $= x^2$ , if  $x > 0$ ,  
       $= 1$ , if  $x = 0$ ,  
at  $a = -1$ ,  $a = 0$ ,  $a = 1$ .

(ix)  $f(x) = \cos(x)$ , if  $x < 0$ ,  
       $= \exp(x)$ , if  $x \geq 0$ ,  
at  $a = -1$ ,  $a = 0$ ,  $a = 1$ .

(x) Plot the graph of  $x^3 + 3*x*y - y^3 = 0$ , using "implicitplot". How many continuous branches exist in the interval  $0.5 < x < 1.5$ ? Is each branch differentiable at  $a = 1$ ?