

MA161 SEMESTER 1, CALCULUS: PROBLEM SHEET 5

1. Let  $f(x) = \sqrt{4-x}$  and  $g(x) = \sqrt{x}$ . Find

- (1)  $f \circ g$  and its domain,
- (2)  $g \circ f$  and its domain,
- (3)  $f \circ f$  and its domain.

2. Write down the values of

$$f(x) = \frac{\cos x}{x - \pi/2}$$

for some values of  $x$  near  $\pi/2$ . Then guess  $\lim_{x \rightarrow \pi/2} f(x)$ .

3. Estimate the value of

$$\lim_{x \rightarrow 0} \frac{\sqrt{x^2 + 9} - 3}{x^2}$$

4. Sketch the graph of

$$f(x) = \begin{cases} 1 + x, & x < -1, \\ \frac{1}{2}x^2, & x \geq -1 \end{cases}$$

For this function, find the following limits (if they exist):

- (a)  $\lim_{x \rightarrow -1^+} f(x)$
- (b)  $\lim_{x \rightarrow -1^-} f(x)$
- (c)  $\lim_{x \rightarrow -1} f(x)$
- (d)  $\lim_{x \rightarrow 1^+} f(x)$
- (e)  $\lim_{x \rightarrow 1^-} f(x)$
- (f)  $\lim_{x \rightarrow 1} f(x)$