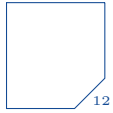


FORENAME: SURNAME: STUDENT NO: 

2019–20

MATH117 Mathematics for Architects – Homework 7 (Calculus)

N. Course

**DEADLINE: Friday 13 December 2019, 4:50pm**

**Exercise 31 (Limits).** Find the following limits. For each one, state which limit laws or other theorems you are using. The first one is done for you.

$$(\omega) \lim_{y \rightarrow -5} \frac{y^2}{y-5} = \frac{\lim_{y \rightarrow -5} y^2}{\lim_{y \rightarrow -5} (y-5)} = \frac{25}{-10} = \frac{-5}{2} \text{ by the quotient, power and difference rules.}$$

$$(a) \lim_{x \rightarrow \frac{2}{5}} 5x(3x-1) =$$

$$(b) \lim_{y \rightarrow -2} \frac{y+3}{y+6} =$$

$$(c) \lim_{v \rightarrow 1} \frac{v-1}{v^2+v-2} =$$

**Exercise 32 (Limits).** Let  $f(x) = 4 - 6x$  and  $g(x) = 2x^2 + 8$ .

$$(a) \text{ Find } \frac{f(x+h) - f(x)}{h}.$$

$$(b) \text{ Find } \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}.$$

$$(c) \text{ Find } \frac{g(x+h) - g(x)}{h}.$$

$$(d) \text{ Find } \lim_{h \rightarrow 0} \frac{g(x+h) - g(x)}{h}.$$

**Exercise 33 (Differentiation).**

(a) Find  $\frac{dy}{dx}$  if  $y = x^{-8}$ .

(b) Find  $f'(t)$  if  $f(t) = 2t^2 - 3t + 1$ .

(c) Find  $\frac{d}{du} (5u^{0.3} - 4u^{2.2})$ .

**Exercise 34 (Differentiation).**

(a) Differentiate  $f(x) = \frac{2x+3}{x-2}$ .

(b) Find  $g'(2)$  if  $g(x) = (x^2 + 1)(2x - 3)$ .

(c) Find  $\frac{d}{dx} \left( \frac{x^4 - x^3}{3x - 1} \right)$ .

**Exercise 35 (Higher Order Derivatives).**

(a) Find  $\frac{d^2}{dx^2} (x^2 + x^{-2})$

(b) Find  $g'''(3)$  if  $g(x) = \frac{x^4 - x^3}{x^2 - x}$ .