

Name: *Solution*

Student Number:

Problem 1

Evaluate the limit

$$\begin{aligned} \lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - 3x + 2} &= \lim_{x \rightarrow 2} \frac{(x-3)(\cancel{x-2})}{(x-2)(x-1)} = \lim_{x \rightarrow 2} \frac{(x-3)}{(x-1)} \\ &= \frac{2-3}{2-1} = -1 \end{aligned}$$

Problem 2

(a) What is wrong with the following equation?

$\frac{x^2 + x - 6}{x - 2} = x + 3$

Note that $\frac{x^2 + x - 6}{x - 2}$ is not defined at $x = 2$, but $x + 3$ is. So functions have different domains. We should write

$$\frac{x^2 + x - 6}{x - 2} = x + 3 \quad \boxed{\text{if } x \neq 2}$$

(b) In view of part (a), explain why the equation

$$\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2} = \lim_{x \rightarrow 2} (x + 3)$$

This equation is now correct because

$$\frac{x^2 + x - 6}{x - 2} = x + 3, \quad x \neq 2$$

and when we're finding $\lim_{x \rightarrow a} f(x)$, we never consider $x = a$ (we only look at what happens around $x = a$).