

## ECON3120/4120 Mathematics 2, spring 2007

### Problems related to the second lecture

**1** Find the limits:

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

(b)  $\lim_{x \rightarrow -1} \frac{4 - \sqrt{x + 17}}{2x + 2}$

(c)  $\lim_{x \rightarrow -1} \frac{2e^{x+1} - x^2 - 4x - 5}{(x + 1)^3}$

**2** (a) Let  $f(x)$  be defined for all  $x > 0$  by

$$f(x) = (\ln x)^3 - 2(\ln x)^2 + \ln x.$$

Calculate  $f(e^2)$  and find the zeros of  $f(x)$ .

(b) Show that  $f(x)$  defined on  $[e, \infty)$  has an inverse function  $h$  and find  $h'(2)$ .

**3** The equation

$$\ln y + y = 1 - 2 \ln x - 0.2(\ln x)^2$$

defines  $y$  as a function of  $x$  for  $x > 0$ ,  $y > 0$ . Calculate  $y'$  and show that  $y' = 0$  for  $x = e^{-5}$ .