

**Mathematics for Economists I**  
**Problems 8**

**L'Hospital's rule**

Calculate the following limits using l'Hospital's rule. Try to calculate them using another method as well, if possible, and compare the effectiveness of both methods.

1.  $\lim_{x \rightarrow +\infty} \frac{6x+9}{3x-1}$
2.  $\lim_{x \rightarrow +\infty} \frac{5x^2+3x+2}{6x}$
3.  $\lim_{x \rightarrow 2} \frac{x^2-3x+1}{x-2}$
4.  $\lim_{x \rightarrow 1} \frac{x^2-1}{x-1}$
5.  $\lim_{x \rightarrow 1} \frac{x^{10}-1}{x-1}$
6.  $\lim_{x \rightarrow 1} \frac{\ln x}{x-1}$
7.  $\lim_{x \rightarrow 0} \frac{e^x-1}{x}$
8.  $\lim_{x \rightarrow +\infty} \frac{e^x}{x^2+1}$
9.  $\lim_{x \rightarrow +\infty} e^{-x}(x^3 + x^2 + x + 1)$
10.  $\lim_{x \rightarrow 0^+} (\ln x)\sqrt{x}$
11.  $\lim_{x \rightarrow -\infty} e^x(x^2 + x + 3)$
12.  $\lim_{x \rightarrow 4} \frac{\ln(x^2-2x-7)}{x^2-6x+8}$
13.  $\lim_{x \rightarrow 3} \frac{\ln(x^2-x-5)}{x^2-7x+12}$

**Solutions:**

1. 2.    2.  $+\infty$ .    3.  $-\infty$ , l'Hospital's rule cannot be used.    4. 2.  
5. 10.    6. 1.    7. 1.    8.  $+\infty$ .    9. 0.    10. 0.    11. 0.    12. 3.  
13. -5.