

## Quiz 7

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

**Question 1.** (5 marks) §8.7 #40

Evaluate the limit, using L'Hôpital's Rule if necessary.

$$\begin{aligned} & \lim_{x \rightarrow \infty} x \tan\left(\frac{1}{x}\right) \quad \text{IF } \infty \cdot 0 \\ &= \lim_{x \rightarrow \infty} \frac{\tan\left(\frac{1}{x}\right)}{\frac{1}{x}} \quad \text{IF } \frac{0}{0} \\ &= \lim_{x \rightarrow \infty} \frac{\sec^2\left(\frac{1}{x}\right) \cdot \frac{-1}{x^2}}{\frac{-1}{x^2}} \quad \text{by } \hat{H} \\ &= \lim_{x \rightarrow \infty} \frac{1}{\cos^2\left(\frac{1}{x}\right)} \\ &= \frac{1}{1} = 1 \end{aligned}$$

**Question 2.** (5 marks) §8.7 #46

Evaluate the limit, using L'Hôpital's Rule if necessary.

$$\begin{aligned} y &= \lim_{x \rightarrow 1^+} (\ln x)^{x-1} \quad \text{IF } 0^0 \\ \ln y &= \lim_{x \rightarrow 1^+} \ln (\ln x)^{x-1} \\ \ln y &= \lim_{x \rightarrow 1^+} (x-1) \ln (\ln x) \quad \text{IF } 0 \cdot -\infty \\ \ln y &= \lim_{x \rightarrow 1^+} \frac{\ln (\ln x)}{\frac{1}{x-1}} \quad \text{IF } \frac{-\infty}{\infty} \\ \ln y &= \lim_{x \rightarrow 1^+} \frac{\frac{1}{\ln x} \cdot \left(\frac{1}{x}\right)}{\frac{-1}{(x-1)^2}} \quad \text{by } \hat{H} \\ \ln y &= \lim_{x \rightarrow 1^+} \frac{-\frac{1}{x^2 \ln x}}{\frac{-2(x-1)}{(x-1)^3}} \\ \ln y &= \lim_{x \rightarrow 1^+} \frac{-x^2 + 2x - 1}{x \ln x} \quad \text{IF } \frac{0}{0} \\ \ln y &= \lim_{x \rightarrow 1^+} \frac{-2x + 2}{\ln x + x \frac{1}{x}} \quad \text{by } \hat{H} \\ \ln y &= \lim_{x \rightarrow 1^+} \frac{-2x + 2}{\ln x + 1} \\ \ln y &= 0 \\ y &= e^0 \\ y &= 1 \end{aligned}$$