

## Homework week 3 Calculus

$$(11) \lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x - 2} = \lim_{x \rightarrow 2} \frac{2x - 1}{1} = 3$$

$$(13) \lim_{x \rightarrow 0} \frac{\sqrt{4+x^2} - 2}{x} = \lim_{x \rightarrow 0} \frac{-2x}{2\sqrt{4-x^2}} = 0$$

$$(15) \lim_{x \rightarrow 0} \frac{e^x - (1-x)}{x} = \lim_{x \rightarrow 0} \frac{e^x + 1}{1} = 2$$

$$(16) \lim_{x \rightarrow 1} \frac{\ln x^2}{x^2 - 1}$$

$$(33) \lim_{x \rightarrow \infty} \frac{\ln x}{x^2} = \lim_{x \rightarrow \infty} \frac{1/x}{2x} = \lim_{x \rightarrow \infty} \frac{1}{2x^2} = 0$$

$$(35) \lim_{x \rightarrow \infty} \frac{e^x}{x^2} = \lim_{x \rightarrow \infty} \frac{e^x}{2x} = \lim_{x \rightarrow \infty} \frac{e^x}{2} = \infty$$

$$(43) \lim_{x \rightarrow \infty} x^{1/x} = \infty^0 \quad y = \lim_{x \rightarrow \infty} x^{1/x}$$

$$\ln y = \lim_{x \rightarrow \infty} \ln(x)^{1/x}$$

$$\ln y = \lim_{x \rightarrow \infty} \frac{1}{x} \ln(x)$$

$$\ln y = \lim_{x \rightarrow \infty} \left(\frac{1}{x}\right) = 0$$

$$\ln y = 0 \quad e^{\ln y} = e^0 \rightarrow \boxed{y=1} \rightarrow \boxed{\lim_{x \rightarrow \infty} x^{1/x} = 1}$$

$$(45) \lim_{x \rightarrow 0^+} (1+x)^{1/x} = e$$

$$y = \lim_{x \rightarrow 0^+} (1+x)^{1/x}$$

$$\ln y = \lim_{x \rightarrow 0^+} \ln (1+x)^{1/x}$$

$$\ln y = \lim_{x \rightarrow 0^+} \frac{1}{x} \ln(1+x)$$

$$\ln y = \lim_{x \rightarrow 0^+} \frac{\left(\frac{1}{1+x}\right)}{1} = 1$$

$$\ln y = 1$$

$$e^{\ln y} = e^1$$

$$y = e$$

$$\lim_{x \rightarrow 0^+} (1+x)^{1/x} = e$$

this was the definition of  $e$ , weat 3, full quarter

$$(53) \lim_{x \rightarrow 1^+} \left( \frac{3}{\ln x} - \frac{2}{x-1} \right) = \infty - \infty$$

Common denominator

$$= \lim_{x \rightarrow 1^+} \frac{3(x-1) - 2\ln x}{(\ln x)(x-1)} = \lim_{x \rightarrow 1^+} \frac{3x - 3 - 2\ln x}{x\ln x - \ln x}$$

$$= \lim_{x \rightarrow 1^+} \frac{3 - (2/x)}{(1\ln x + x/x) - 1/x} = \frac{1}{0} = +\infty$$



