MAL100: Mathematics I

Tutorial Sheet 10

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1. Find the limits of the following functions:

   (a) $\lim\limits_{(x,y)\to(0,0)} \dfrac{e^y \sin x}{x}$.

   (b) $\lim\limits_{(x,y)\to(\pi,0)} \dfrac{1-\sin y}{y+\cos x}$.

   (c) $\lim\limits_{\substack{(x,y)\to(1,1)\\ x\neq y}} \dfrac{x^2-y^2}{x+y}$.

   (d) $\lim\limits_{\substack{(x,y)\to(0,0)\\ x\neq y}} \dfrac{\sqrt{x}+\sqrt{y}}{x+2\sqrt{x}-y+2\sqrt{y}}$.

   (e) $\lim\limits_{\substack{(x,y)\to(4,3)\\ x\neq y+1}} \dfrac{\sqrt{x}-\sqrt{y+1}}{x-y-1}$.

   (f) $\lim\limits_{(x,y,z)\to\left(\frac{-1}{4},\frac{\pi}{2},2\right)} \tan^{-1}(xyz)$.

   (g) $\lim\limits_{(x,y,z)\to(\pi,0,3)} ze^{-2y}\cos 2x$.

2. At what points (x, y) in the plane are the following functions continuous:

   (a) $f(x,y) = \ln(x^2+y^2)$.

   (b) $f(x,y) = \dfrac{x^2+y^2}{x^2-y^2}$.

   (c) $f(x,y) = \dfrac{x^2 y}{x^2+y^2}$.

3. At what points (x, y, z) in the space are the following functions continuous:

   (a) $h(x,y,z) = xy\cos\dfrac{1}{z}$.

   (b) $h(x,y,z) = \dfrac{1}{|y|+|z|}$.

   (c) $h(x,y,z) = \dfrac{1}{|xy|+|z|}$.