Solutions: quiz 4, discussion section 11am

Math 226, Fall 2019, Prof. Mazel-Gee

1. We compute the partial derivatives u_{tt} and u_{xx} as follows:

$$u_t = -a\cos(x-at) + \frac{a}{x+at} \quad \Rightarrow \quad u_{tt} = -a^2\sin(x-at) - \frac{a^2}{(x+at)^2} \ ,$$
$$u_x = \cos(x-at) + \frac{1}{x+at} \quad \Rightarrow \quad u_{xx} = -\sin(x-at) - \frac{1}{(x+at)^2} \ .$$

   So indeed we have that

$$a^2 u_{xx} = -a^2\sin(x-at) - \frac{a^2}{(x+at)^2} = u_{tt} \ .$$

2. Taking $x = r\cos\theta$ and $y = r\sin\theta$, we have

$$\lim_{(x,y)\to(0,0)} \frac{x^3+y^3}{x^2+y^2} = \lim_{r\to 0^+} \frac{r^3\cos^3\theta + r^3\sin^3\theta}{r^2\sin^2\theta + r^2\cos^2\theta} = \lim_{r\to 0^+} r(\cos^3\theta + \sin^3\theta) = 0 \ .$$