

APM 346, practice problems for week 8.

1. Solve the following problem:

$$\nabla^2 u = f, \quad u|_{\partial Q} = 0$$

with (a) $f = xyz$, (b) $f = x + y + z$, (c) $f = e^{x+y+z}$, (d) $f = \sin((x + y + z))$, (e) $f = \cos \pi x \cos \pi y \cos \pi z$.

2. Solve the following problem:

$$\frac{\partial u}{\partial t} = \nabla^2 u, \quad u|_{(0,+\infty) \times \partial Q} = 0, \quad u|_{t=0} = f,$$

with (a-e) f the same as in 1(a-e), (f) $f = \sin \pi x \sin \pi y \sin \pi z + \sin 1000 \pi x \sin 1000 \pi y \sin 1000 \pi z$, (g) $f = \begin{cases} 0, & 0 \leq x < \frac{1}{2}, \\ 1, & \frac{1}{2} < x \leq 1. \end{cases}$