Dr. Z.'s Calc5 Homework assignment 18

1. Find the general expression, in polar coordinates, for the steady-state temperature $u(r, \theta)$ in a circular plate of radius 1, if the temperature on the circumference $r = 1$ is given by $u(1, \theta) = \cos 7\theta$.

2. Find the general expression, in polar coordinates, for the steady-state temperature $u(r, \theta)$ in a circular plate of radius 2, if the temperature on the circumference $r = 2$ is given by $u(2, \theta) = 3\cos 5\theta + 11 \sin 3\theta - 19 \sin 29\theta$.

3. Find the general expression, in polar coordinates, for the steady-state temperature $u(r, \theta)$ in a circular plate of radius 2, if the temperature in the top half of the circumference (above the x-axis) is 100 degrees and at the bottom half is 0.

4. Find the general expression, in polar coordinates, for the steady-state temperature $u(r, \theta)$ in a circular plate of radius 3, if the temperature on the circumference at the top half ($0 < \theta < \pi$) is θ degrees and and at the bottom half ($\pi < \theta < 2\pi$) is $\pi - \theta$.

5. Find the general expression, in polar coordinates, for the steady-state temperature $u(r, \theta)$ in the **infinite** plane with a circular hole of radius c cut-out, and where the temperature at the bounding ring is $u(c, \theta) = f(\theta), 0 < \theta < 2\pi$.