Suggested problems 36

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1. Find the steady-state solution $v(x)$ of the heat conduction equation, given each set of boundary conditions below.

   (a) $u(0,t) = 200, \qquad u(10,t) = 100;$

   (b) $u_x(0,t) = 8, \qquad u(10,t) = 100;$

   (c) $u_x(0,t) = 30, \qquad u_x(10,t) = 10;$

   (d) $u(0,t) + u_x(0,t) = 10, \qquad u(10,t) = 100;$

2. Solve the heat conduction problem of the given initial condition. For the particular solution found, find $\lim_{t\to\infty} u(4,t)$.

$$2u_{xx} = u_t, \qquad 0 < x < 6, t > 0$$

$$u(0,t) = 40, \qquad u(6,t) = 10$$

$$u(x,0) = -5x + 40 + 5\sin(2\pi x) - 2\sin\frac{5\pi x}{2}.$$