LINKÖPINGS TEKNISKA HÖGSKOLA
Matematiska institutionen
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Svar till Tentamen TATA 30 Partial Differential Equations and Finite Elements 15 January 2009, 14-19

1.
$$u(1,1) = \frac{7}{8}$$

2.
$$u(x,y) = x + \sum_{k=0}^{\infty} a_k e^{-2\lambda_k^2 t} \sin \lambda_k x,$$

where
$$\lambda_k = \frac{\pi(2k+1)}{4}$$

and
$$a_k = \frac{1+\cos 2\lambda_k}{\lambda_k} - \frac{(-1)^k}{\lambda_k^2}$$

3. Apply the maximum principle to the function
$$u(x,y) - (x^2+y^2)/4$$

4.
$$u(x,t) = \frac{1}{2}\Big(e^t \delta(x+t) + e^{-t}\delta(x-t)\Big).$$

5.
$$f''(x) = 2\sum_{k=-\infty}^{\infty} \delta(x-k\pi) + h(x),$$

where $h(x) = (-1)^{k+1}\sin x$ for $x \in [k\pi, (k+1)\pi]$, $k = 0, \pm 1, \ldots$.