Math 472: Assignment 7 — due Wednesday, Nov. 30, 2005

1. Provide the details of the case $j = 0$ in the formula

$$D_{j0} = \frac{d}{dt}\left[\operatorname{sinc}\frac{t\pi}{h}\right]_{t=t_j=jh} = \begin{cases} 0, & j = 0 \\ \frac{(-1)^j}{jh}, & \text{otherwise,} \end{cases}$$

   for the entries in the $k = 0$ column of the differentiation matrix D on unbounded grids.

2. Derive the formula

$$D_{j0}^{(2)} = \frac{d^2}{dt^2}\left[\operatorname{sinc}\frac{t\pi}{h}\right]_{t=t_j=jh} = \begin{cases} -\frac{\pi^2}{3h^2}, & j = 0 \\ 2\frac{(-1)^{j+1}}{j^2h^2}, & \text{otherwise,} \end{cases}$$

   for the entries in the $k = 0$ column of the second-order differentiation matrix $D^{(2)}$ on unbounded grids.