FINAL EXAM ANSWERS
MATH 126 AUTUMN 2011

1. (a) T; (b) F; (c) F; (d) F; (e) F; (f) F; (g) T; (h) T; (i) F; (j) F

2. (a) $\cos^{-1}\left(\frac{1}{\sqrt{7}}\right)$

   (b) $\sqrt{3}$

   (c) $2x + 5y - z = 9$

3. (a) $f(t) = -2t$ and $g(t) = 6t^2$

   (b) $a_T = \dfrac{144t}{\sqrt{5 + 144t^2}}$ and $a_N = \dfrac{12\sqrt{5}}{\sqrt{5 + 144t^2}}$

   (c) $\kappa(t) = \dfrac{12\sqrt{5}}{(5 + 144t^2)^{3/2}}$

4. $f_t(x,t) = -\dfrac{1}{2\sqrt{2\pi t^3}} e^{-x^2/2t} + \dfrac{x^2}{2\sqrt{2\pi t^5}} e^{-x^2/2t}$

   $f_{xx}(x,t) = -\dfrac{1}{\sqrt{2\pi t^3}} e^{-x^2/2t} + \dfrac{x^2}{\sqrt{2\pi t^5}} e^{-x^2/2t} = 2f_t(x,t)$

5. 128 cm^2

6. The dimensions of the base are $x = y = \left(\dfrac{2V}{5}\right)^{1/3}$ and the height is $z = \left(\dfrac{25V}{4}\right)^{1/3}$.

7. (a) $\displaystyle\int_1^e \int_{\ln x}^{-x+(1+e)} f(x,y)\,dy\,dx = \int_0^1 \int_1^{e^y} f(x,y)\,dx\,dy + \int_1^e \int_1^{-y+(1+e)} f(x,y)\,dx\,dy$

   (b) $(1 - 6e^{-5})\pi$

8. (a) $T_2(x) = -1 + \ln 3 + 4(x-1) + \frac{7}{2}(x-1)^2$

   (b) $|f(x) - T_2(x)| \le \dfrac{a^3}{3(1-a)^3}$ (other answers are possible)

   (c) $a = 0.237$ (other answers are possible)

9. (a) $\displaystyle\sum_{k=0}^{\infty} \left(\frac{7^k}{3^{k+1}} - \frac{5^k}{2^{k+1}}\right) x^k$

   (b) $-\dfrac{2}{5} < x < \dfrac{2}{5}$