Exam II HINTS AND ANSWERS
MATH 126 D AUTUMN 2011 — Version Alpha

1. (a) (8 points) ANSWER: $\overrightarrow{T}\left(\frac{\pi}{6}\right) = \langle 0, 0, -1\rangle$, $\overrightarrow{N}\left(\frac{\pi}{6}\right) = \langle -\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, 0\rangle$, $\overrightarrow{B}\left(\frac{\pi}{6}\right) = \langle -\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0\rangle$

   (b) (4 points) ANSWER: $z = 0$

2. HINT: Let (x, y, z) be an arbitrary point on the surface. Use the distance formula to find the distance from this point to $(0, 1, 3)$. Then use the fact that $x^2 = 12 + yz$ to write the distance in terms of only y and z. You may then minimize the expression under the square root. That is, minimize the function $S(y, z) = 12 + yz + (y-1)^2 + (z-3)^2$.

   ANSWER: $\left(\pm\sqrt{\frac{88}{9}}, -\frac{2}{3}, \frac{10}{3}\right)$

3. (6 points each)

   (a) ANSWER: $\frac{8}{3}\left(5^{3/2} - 1\right)$

   (b) ANSWER: $\displaystyle\int_0^1 \int_0^{10} h(x, y)\, dx\, dy + \int_1^{101} \int_{\sqrt{y-1}}^{10} h(x, y)\, dx\, dy$

4. HINT: Two possibilities:

   - area $= \displaystyle\int_{-\pi/2}^{0} \int_0^{1+\sin\theta} r\, dr\, d\theta + \int_0^{\pi/2} \int_{\sin\theta}^{1+\sin\theta} r\, dr\, d\theta$
   - area $= \displaystyle\int_{-\pi/2}^{\pi/2} \int_0^{1+\sin\theta} r\, dr\, d\theta - \int_0^{\pi/2} \int_0^{\sin\theta} r\, dr\, d\theta$

   ANSWER: $\frac{5\pi}{8}$