MATHEMATICS 317 April 2004 Final Exam Answers

1. (a) $\frac{5}{2}$ (b) $\hat{\mathbf{T}} = \frac{1}{5}\big(-\frac{3}{2}, \frac{3\sqrt{3}}{2}, 4\big)$, $\hat{\mathbf{N}} = \frac{1}{2}\big(\sqrt{3}, 1, 0\big)$, $\hat{\mathbf{B}} = \frac{1}{5}\big(-2, 2\sqrt{3}, -3\big)$

2. (a), (b), (c) See the solutions.
   (d) Yes, assuming that $\hat{\mathbf{T}}$, $\hat{\mathbf{N}}$ and $\hat{\mathbf{B}}$ are all well–defined.
   (e) No.

3. $\frac{8}{27}\left[\left(\frac{13}{4}\right)^{3/2} - 1\right]$

4. (a) $\frac{8}{27}\left[\left(\frac{13}{4}\right)^{3/2} - 1\right]$ (b) $e^e - \beta(e+1)$

5. $\iint_S \mathbf{F} \cdot \hat{\mathbf{n}}\, \mathrm{d}S = \frac{16}{3}\pi$

6. $\frac{2\pi}{3\sqrt{3}}$.

7. $\iint_S \boldsymbol{\nabla} \times \mathbf{F} \cdot \hat{\mathbf{n}}\, \mathrm{d}S = \pi$

8. $\boldsymbol{\nabla} \cdot \mathbf{F}(0,0,0) = \frac{3}{4}$.