I have not combined the questions and answers into one file yet (12/23/04). Here are the answers, for now. Most have references to where you can find the question in your book. 

**Answers and Remarks:** Most of these were taken directly from the exercises in the textbook. The average grade was about 60. This does not include the grade of Mr.X. He wrote me a note that he only took the final to help lower the curve!

1) 14.7.1, \( \int_{\partial S} F \cdot T = \int_{0}^{2\pi} <3y, -2x, xyz> \cdot < -2\sin \theta, 2\cos \theta, 0 > \ d\theta = -20\pi 
\)

2) 14.5.7, \( \int_{0}^{2\pi} \int_{0}^{3} r^2 \sqrt{3} r \ dr \ d\theta = \sqrt{3} 81\pi/2 
\)

3) 14.3.27, \( \phi(x, y, z) = xyz. 
\)

4) 13.2.25, \( \int_{0}^{4} \int_{\sqrt{y}}^{\sqrt{y}} x^2 y \ dx \ dy = 512/21 
\)

5) 11.4.35, Parallel. Check the dot product of the plane’s normal vector, and the line’s direction vector. Zero.

6) TFTTF

7) 11.6.9, The simplest method is \( \kappa = |y''|/\sqrt{1+y'^2}^{3/2} = 1. \) To use the space curve formula, set \( r(t) = <t, \cos(t), 0> \) and plug in.

8) See 13.4, Example 4.

9) 12.9.11, Set \( <y, x, 2> = \lambda <2x, 2y, 2z> \) and get \( y = x \) or \( y = -x \) etc. Max of 20 at \( (4,4,2). \) Min of -20 at \( (4,-4,-2). \)

10) (proof) See the textbook.

Bonus) See the textbook (use polar coordinates), get \( \sqrt{\pi}/2. \)