NAME ______________________________

STUDENT ID ______________________________

RECITATION INSTRUCTOR ______________________________

RECITATION TIME ______________________________

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DIRECTIONS

1. Write your name, student ID number, recitation instructor's name and recitation time in the space provided above. Also write your name at the top of pages 2, 3, 4 and 5.
2. The test has five (5) pages, including this one.
3. Write your answers in the boxes provided.
4. You must show sufficient work to justify all answers. Correct answers with inconsistent work may not be given credit.
5. Credit for each problem is given in parentheses in the left hand margin.
6. No books, notes or calculators may be used on this test.

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(4) 1. Find a unit vector having the same direction as the vector $\vec{a} = \vec{i} + \vec{j} - \vec{k}$.

(6) 2. If $\vec{a} = 2\vec{i} - \vec{j} + 2\vec{k}$ and $\vec{b} = \vec{i}$, find $pr_{\vec{a}}\vec{b}$.

(7) 3. Find the area of the triangle with vertices at $(0,0,0)$, $(3,2,0)$, and $(2,6,0)$.

(4) 4. Find x so that the vectors

$$\vec{a} = \vec{\imath} + 3\vec{\jmath} - x\vec{k} \quad \text{and} \quad \vec{b} = (1+x)\vec{\imath} + \vec{\jmath} - \vec{k}$$

are perpendicular.

(8) 5. The points $(1,0,0)$ and $(\frac{7}{3}, \frac{2}{3}, \frac{2}{3})$ lie on a sphere with center at $(a, -\frac{1}{3}, -\frac{1}{3})$ and radius $\sqrt{2}$. Find a.

(5) 6. A person pulls a sled 100 feet with a rope that makes an angle of $\frac{\pi}{4}$ with the horizontal ground. Find the work done on the sled if the tension in the rope is 5 pounds.

(4) 7. (a) If $\vec{a} \times \vec{b} = \vec{i} - 2\vec{j} + \vec{k}$, then $\vec{b} \times \vec{a} =$

(b) $\vec{i} \times (\vec{j} \times \vec{k}) =$

(14) 8. Find the following limits

(a) $\lim\limits_{x \to 0^+} \dfrac{x^2}{x - \sin x}$

(b) $\lim\limits_{x \to \infty} \left(1 - \dfrac{1}{x}\right)^x$

(6) 9. $\int_1^2 \ln x \, dx =$

(24) 10. Evaluate the integrals:

(a) $\int x \sin x \, dx$

(b) $\int \tan^2 x \sec^4 x \, dx$

(c) $\int \cos^2 x \sin^3 x \, dx$

(d) $\int \tan x \sec^3 x \, dx$

(18) 11. Evaluate the integrals. PARTIAL CREDIT will not be given unless steps are clearly shown.

(a) $\displaystyle\int_0^2 \sqrt{4-x^2}\,dx$

(b) $\displaystyle\int \frac{\sqrt{x^2+1}}{x^4}\,dx$