
February 11, 2004

Do all problems

Show all work

1. Suppose $\bar{u} = -1\bar{i} - 2\bar{j} + 2\bar{k}$, $\bar{v} = \bar{i} + 4\bar{j}$, and $\bar{w} = 4\bar{i} + 2\bar{j} - 4\bar{k}$. Find the following.

(a) (4 points) $\|\bar{u}\|$,

(b) (4 points) a unit vector in the direction of \bar{u} ,

(c) (8 points) write \bar{v} as the sum of two vectors, one in the direction of \bar{u} and the other perpendicular to \bar{u} ,

(d) (8 points) $\bar{v} \times \bar{w}$,

(e) (8 points) the volume of the parallelepiped with adjacent sides \bar{u} , \bar{v} , and \bar{w} .

2. (12 points) Let P, Q, and R be three points with Cartesian coordinates $(5, -2, 0)$, $(-2, 2, -1)$, and $(3, 2, -4)$. Find an equation of the plane containing P, Q, and R.

3. (12 points) An airplane is heading west at an airspeed of 400 km/hr, but there is a wind blowing from the southwest at 30 km/hr. Set up a coordinate system so that the x -axis points east. Find the vector which represents the velocity of the plane relative to the ground.

4. Evaluate the following integrals.

(a) (6 points) $\int (x^3 + 2x + \sin x) dx$,

(b) (6 points) $\int x e^{2x} dx$,

(c) (6 points) $\int \frac{x+3}{x^3+3x^2+2x} dx$,

(d) (6 points) $\int \frac{1}{4+x^2} dx$.

5. (8 points) Evaluate the definite integral $\int_0^1 x^2 e^{(x^3+5)} dx$ exactly.
6. Consider the definite integral $\int_0^4 x^2 dx$.
- (a) (6 points) Find LEFT(2), RIGHT(2), and TRAP(2).
 - (b) (4 points) Evaluate the integral exactly.
 - (c) (2 points) Which of the answers in part (a) is most accurate?