MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find $v \cdot u$.
1) $v = 2i + 4j$ and $u = 9i + 8j$
   A) $-14$ B) $11i + 12j$ C) $50$ D) $18i + 32j$  

Find the vector $\text{proj}_v u$.
2) $v = 3i - j + 3k$, $u = 11i + 2j + 10k$
   A) $\frac{195}{19}i - \frac{65}{19}j + \frac{195}{19}k$ B) $\frac{671}{15}i + \frac{122}{15}j + \frac{122}{3}k$
   C) $\frac{183}{19}i - \frac{61}{19}j + \frac{183}{19}k$ D) $\frac{671}{225}i + \frac{122}{225}j + \frac{122}{45}k$

Find the angle between $u$ and $v$ in radians.
3) $u = 3i + 9j + 9k$, $v = 6i + 10j + 9k$
   A) $1.38$ B) $0.19$ C) $1.06$ D) $1.50$

Solve the problem.
4) Find the area of the triangle determined by the points $P(1, 1, 1)$, $Q(-3, 5, 6)$, and $R(-9, 7, -7)$.
   A) $\sqrt{10824}$ B) $\sqrt{18.609}$ C) $\sqrt{18,609}$ D) $\sqrt{10824}$

Find parametric equations for the line described below.
5) The line through the points $P(-1, -1, -3)$ and $Q(5, -6, 5)$
   A) $x = 6t - 1, y = -5t - 1, z = 8t - 3$ B) $x = -t - 6, y = t + 5, z = -3t - 8$
   C) $x = 6t + 1, y = -5t + 1, z = 8t + 3$
6) The line through the point $P(-4, -5, -2)$ and perpendicular to the plane $4x + 2y + 3z = 6$
   A) $x = 4t + 4, y = 2t + 5, z = 3t + 2$ B) $x = -2t - 4, y = 4t - 5, z = -2$
   C) $x = -4t + 4, y = -2t + 5, z = -3t + 2$ D) $x = 4t - 4, y = 2t - 5, z = 3t - 2$

Write the equation for the plane.
7) The plane through the point $P(-5, -6, 4)$ and normal to $n = 7i + 3j + 5k$
   A) $7x + 3y + 5z = -33$ B) $-7x - 6y + 4z = -33$
   C) $5x + 6y - 4z = -33$ D) $7x - 3y - 5z = -33$
8) The plane through the points $P(5, -2, 14)$, $Q(-3, -4, 20)$ and $R(-1, -2, 4)$.
   A) $3x + 5y + z = -9$ B) $5x + y + 3z = -9$
   C) $5x + y + 3z = 9$ D) $3x + 5y + z = 9$

Find an equation for the sphere with the given center and radius.
9) Center $(0, -5, -2)$, radius $= 5$
   A) $x^2 + y^2 + z^2 + 10y + 4z = -4$ B) $x^2 + y^2 + 5z^2 + 10y + 4z = -4$
   C) $x^2 + y^2 + z^2 + 10y - 4z = -4$ D) $x^2 + y^2 + 5z^2 + 10y - 4z = -4$

Find the center and radius of the sphere.
10) $x^2 + y^2 + z^2 - 6x - 16y + 20z = -92$
   A) $C(3, 8, -10), a = 9$ B) $C(3, 8, -10), a = 81$
   C) $C(3, 8, 10), a = 9$ D) $C(-3, -8, 10), a = 9$