Directions: Answer each question. Simplify. (8 points)

1. (4 points) Find the equation of the plane through the points \((2, 3, 1), (3, 3, 3), \) and \((2, 0, 0)\).

1. \(6x + y - 3z = 12\)

| Solution: If \(A = (2, 3, 1), B = (3, 3, 3), C = (2, 0, 0)\) then \(\vec{AB} = (1, 0, 2)\) and \(\vec{AC} = (0, -3, -1)\)
| \(\vec{AB} \times \vec{AC} = (6, 1, -3)\)
| \(6(x - 2) + (y - 3) - 3(z - 1) = 0 \implies 6x + y - 3z = 12\)

2. (4 points) Find the domain of the vector-valued function \(r(t) = \langle 6t^2 - 3t, \frac{7 - t}{t - 6}, \sqrt{t - 4} \rangle\)

2. \([4, 6) \cup (6, \infty)\)

| Solution: Domain of \(x\): \((-\infty, \infty)\)
| Domain of \(y\): Since \(y\) is undefined when \(t = 6\), the domain is \((-\infty, 6) \cup (6, \infty)\).
| Domain of \(z\): We need the inside of the square root to be positive to get real numbers, so \(x - 4 \geq 0 \implies x \geq 4\). So the domain of \(z\) is \([4, \infty)\).
| Domain of \(r(t)\): This must satisfy the domains of all of the above, so we get \([4, 6) \cup (6, \infty)\).