1. Find the equations of the line which contains the points \((4, 2, -3)\) and \((4, -3, 0)\).

2. Find the equation of the plane which contains the points \((4, 2, -3)\), \((4, -3, 0)\), and \((2, 3, 4)\).

3. Let \(\vec{a} = 4 \hat{i} + 2 \hat{k}\) and \(\vec{b} = 2 \hat{i} - \hat{j} + 3 \hat{k}\). Find vectors \(\vec{u}'\) and \(\vec{v}'\) with \(\vec{b} = \vec{u} + \vec{v}'\), \(\vec{u}'\) parallel to \(\vec{a}'\), and \(\vec{v}'\) perpendicular to \(\vec{a}'\).

4. Find the area inside \(r = 4 \sin \theta\).

5. Find the volume of the solid which is bounded by \(z = x^2 + y^2\) and \(z = \sqrt{1 - x^2 - y^2}\).

6. Describe and graph \(\vec{r}(t) = t \hat{i} + \sin t \hat{j} + \cos t \hat{k}\).

7. Describe and graph \(z = x^2 - y^2\).

8. Find the equations of the line tangent to \(\vec{r}(t) = e^2 t \hat{i} + t \hat{j} - \sqrt{4t^2 - 1} \hat{k}\) at \(t = 1\).

9. Find the equation of the plane tangent to \(z = 2x^2 + y^2\) at the point where \(x = 3\) and \(y = 2\).

10. Compute \(\int_C (12xy) \, dx + (6x^2 - 7e^y + 2y) \, dy\) where \(C\) consists of three line segments. The first line segment for \(C\) starts at \((1,2)\) and goes to \((8,75)\); the second segment is from \((8,75)\) to \((198,706)\); and the third segment is from \((198,706)\) to \((3,4)\).

11. Find the volume of the solid bounded by \(z = 18 - x^2 - y^2\) and \(z = x^2 + y^2 - 18\).

12. Identify all local extreme points and all saddle points of \(f(x, y) = x^2 y - 6y^2 - 3x^2\).

13. Find the global extreme points of \(f(x, y) = 3x + 4y\), which is defined on \(S = \{(x, y) \mid 0 \leq x \leq 1, -1 \leq y \leq 1\}\).

14. Where does \(\frac{x - 1}{2} = \frac{y - 2}{-1}, \ z = 3\) intersect \(4x + 3y + 2z = 6\)?

15. If the temperature of a plate at the point \((x, y)\) is \(T(x, y) = 10 + 2x^2 - y^2\), then find the path a heat-seeking particle (which always moves in the direction of greatest increase of temperature) would follow if it starts at \((4, 2)\).