Exam 2 Review Problems

Name: Date:

P 1. The tension **T** at the end of a chain that serves as a bridge between two cliffs of equal heights, has magnitude 25N. What is the weight of the chain?

P 2. Ropes 3m and 5m in length are fastened to a holiday decoration that is suspended over a town square. The decoration has a mass of 5kg. The ropes, fastened at different heights, make angles 52° and 42° with the horizontal. Find the tension in each wire and the magnitude of each tension.

P 3. Find $\mathbf{a} + \mathbf{b}$, $\mathbf{2a} + \mathbf{3b}$, $|\mathbf{a}|$, and $|\mathbf{a} - \mathbf{b}|$.

(a) $\mathbf{a} = \langle -1, 0, 2 \rangle$ and $\mathbf{b} = \langle 3, 1, -2 \rangle$

(b) $\mathbf{a} = \mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$ and $\mathbf{b} = -2\mathbf{i} - \mathbf{j} + 5\mathbf{k}$

P 4. Find a unit vector that has the same direction as the given vector.

(a) $\langle -4, 2, 4 \rangle$

(b) $8\mathbf{i} - \mathbf{j} - 4\mathbf{k}$

P 5. Determine if the equation represents a sphere. If so find its center and radius.

(a) $3x^2 + 4y^2 + 5z^2 = y^2 + 10 + 6y + 12z + 2z^2$

(b) $x^2 + y^2 + z^2 + 8x - 6y + 2z + 17 = 0$

P 6. Find an equation of a sphere if one of its diameters has endpoints $(2, 1, 4)$ and $(4, 3, 10)$.

P 7. Find a vector $\vec{v}$ that has length 100 and points in the direction of $-\frac{\sqrt{3}}{10}\vec{i} + \frac{1}{10}\vec{k}$.

P 8. Find a vector of length 5 and perpendicular to $4\vec{i} - 3\vec{j} + \vec{k}$.

P 9. Find the parallel and perpendicular components of the force vector $\vec{F} = 2\vec{i} + 4\vec{j}$ in the direction of the the displacement vector $\vec{d} = \vec{i} + 2\vec{j}$.

P 10. Find the parallel and perpendicular components of the force vector $\vec{F} = 5\vec{i} + 2\vec{j}$ in the direction of the the displacement vector $\vec{d} = 3\vec{j}$.

P 11. Find the area of the triangle with vectors $\vec{a} = \vec{i} + 2\vec{j} - \vec{k}$ and $\vec{b} = 4\vec{i} - 2\vec{j} + \vec{k}$ as sides.

P 12. Shortly after takeoff, a plane is climbing northwest through still air at an airspeed of 200 km/hr, and rising at a rate of 300 m/min. Resolve its velocity vector into components. The x-axis points east, the y-axis points north, and the z-axis points up.

P 13. One force is pushing an object in a direction 50° south of east with a force of 25 newtons. A second force is simultaneously pushing the object in a direction 70 north of west with a force of 60 newtons. If the object is to remain stationary, give the direction and magnitude of the third force that must be applied to the object to counterbalance the first two.

P 14. Find an equation of the plane containing the points $A = (2, 1, 0)$, $B = (0, 1, 3)$, and $C = (1, 0, 1)$.

P 15. Sketch a contour plot for $z = 2x^2 + y^2$.

**P 16.** Sketch a contour plot for $z = 3x - 5y + 1$.

P 17. Find an equation of the sphere of radius $\sqrt{10}$ centered at $(4, -19, 0)$.

P 18. Find the center and radius of the sphere with equation $x^2 + 4x + y^2 - 6y + z^2 + 12z = 0$.

P 19. Find a linear function whose graph is the plane that intersects the xy-plane along the line $y = 2x + 2$ and contains the point $(1, 2, 2)$.

P 20. Sketch the cross-sections of $z = \cos \sqrt{x^2 + y^2}$ parallel to the xz-, $yz-$, and xy- plane.

P 21. Find a an equation of the linear function with the following contour plot.
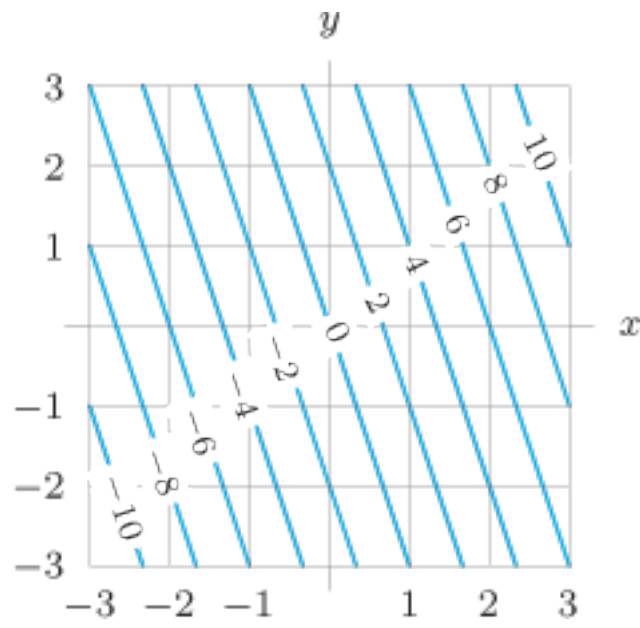
P 22. What value(s) of b make $\vec{v} = 2b\vec{i} - b\vec{j} + 20\vec{k}$ perpendicular to $\vec{w} = 6\vec{i} + b\vec{j} - \vec{k}$

P 23. Find an equation for the plane through the origin containing the points $(3, 5, 0)$ and $(4, 6, 3)$.

P 24. Find a linear function whose graph is the plane that intersects the xy-plane along the line $y = 2x - 8$ and contains the point $(-3, -6, 16)$.

P 25. Find an equation of a cylinder of radius $\sqrt{11}$ and its axis along the y-axis.

P 26. Assuming the table contains values of a linear function, complete the table.

	y		
x	**2.5**	**3.0**	**3.50**
−1	6	7	8
1	0	1	2
3	−6	−5	−4