

## Chapter 12

Let  $A = (4, 1, 3)$ ,  $B = (0, 3, -1)$ , and  $C = (6, 3, 2)$ .

10. Find the length of  $\overline{AB}$ .  
 11. Find the midpoint of  $\overline{AB}$ .  
 12. Show that  $\overrightarrow{AB}$  is perpendicular to  $\overrightarrow{AC}$ .  
 13. Find the area of  $\triangle ABC$ .

Find each of the following for the plane whose equation is

$$3x + 4y - 2z = 5.$$

14. a vector perpendicular to the plane  
 15. a point in the plane

$$x + 2y - 3z = -6$$

16. Solve the system  $\begin{cases} 2x - y + z = -5 \\ x - 2z = -5 \end{cases}$  by using Cramer's rule.

Let  $\mathbf{u} = (1, 0, -2)$ ,  $\mathbf{v} = (-3, 1, 5)$ , and  $\mathbf{w} = (-2, 4, 3)$ . Calculate each expression.

17.  $\mathbf{u} \times \mathbf{v}$   
 18.  $\mathbf{v} \times \mathbf{w}$   
 19.  $\mathbf{v} \cdot (\mathbf{w} \times \mathbf{u})$

### MIXED REVIEW

Chapters 1–12

1. If  $\frac{1}{4} + \frac{\sqrt{7}}{4}i$  is a root of  $4x^3 + x + 1 = 0$ , find the other two roots.

Simplify.

2.  $2 \sin 345^\circ \cos 345^\circ$   
 3.  $\log 0.1 + e^{\ln 8}$   
 4.  $(1 + i\sqrt{3})^9$

Solve for  $x$ .

5.  $x^4 + 3 < 4x^2$   
 6.  $|4x - 7| = 3$   
 7.  $6x^3 + 4x + 3 = 13x^2$   
 8.  $9^{x+1} = 27\sqrt{3}$   
 9.  $\cos x = \frac{1}{\sec x}$   
 10.  $\sin x = 0.6$

11. The equation  $h(t) = -4.9t^2 + 7t + 20$  gives the height of a ball in meters  $t$  seconds after it is thrown in the air. Find the maximum height reached by the ball and the number of seconds it is in the air until it first hits the ground.
12. Find the inclination of any line perpendicular to the line  $2x - 5y = 10$ .
13. When the equation of a periodic function is changed from  $y = f(x)$  to  $y = f(3x)$ , is its amplitude or period changed, and how is it changed?
14. Find the cube roots of  $-8i$ .
15. If  $A = (-3, 4, 1)$ ,  $B = (1, 0, -1)$ , and  $C = (2, 1, 0)$ , find a vector equation for  $\overleftrightarrow{AB}$ , and an equation for the plane that contains  $A$ ,  $B$ , and  $C$ .
16. Solve  $2 \cos^2 \theta = \sin \theta - 1$  for  $0^\circ \leq \theta < 360^\circ$ .
17. If  $\alpha$  and  $\beta$  are first-quadrant angles,  $\sin \alpha = \frac{21}{29}$ , and  $\cos \beta = \frac{15}{17}$ , find  $\cos(\alpha + \beta)$ ,  $\tan 2\beta$ , and  $\tan \frac{\alpha}{2}$ .
18. Solve  $\triangle ABC$  if  $\angle A = 20^\circ$ ,  $a = 36$ , and  $b = 40$ .
19. If  $\mathbf{u} = (-1, 3)$  and  $\mathbf{v} = (4, 8)$ , show that the vector  $2\mathbf{u} - \mathbf{v}$  is perpendicular to  $\mathbf{u}$ .
20. If  $f$  is a linear function such that  $f(2) = 8$  and  $f(5) = 2$ , find the zero of  $f$  and find  $f(2.5)$ .