

## Additional Review Problem Answers

5. a.  $\mathbf{v} = (1, 4)$ ;  $|\mathbf{v}| = \sqrt{1^2 + 4^2} = \sqrt{17}$   
 b.  $(x, y) = (-2 + t, -2 + 4t)$ ;  $x = -2 + t$ ,  $y = -2 + 4t$   
 c. Substitute parametric eqs. into  $y = 4x^2 - 6x$ ;  $-2 + 4t = 4(-2 + t)^2 - 6(-2 + t)$ ;  
 $-2 + 4t = 4(4 - 4t + t^2) + 12 - 6t$ ;  $4t^2 - 26t + 30 = 0$ ;  $2(2t - 3)(t - 5) = 0$ ;  
 $t = \frac{3}{2}, 5$ ; at  $t = \frac{3}{2}$ ,  $(-\frac{1}{2}, 4)$  and at  $t = 5$ ,  $(3, 18)$ .
6.  $\mathbf{u}$  and  $\mathbf{v}$  are opposite in direction.  $\cos \theta = \frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{u}||\mathbf{v}|}$ . Thus,  $\mathbf{u} \cdot \mathbf{v} = |\mathbf{u}||\mathbf{v}| \cos \theta$ .  
 If  $\mathbf{u} \cdot \mathbf{v} = -|\mathbf{u}||\mathbf{v}|$ , then  $\cos \theta = -1$ . Therefore,  $\theta = 180^\circ$  and  $\mathbf{u}$  and  $\mathbf{v}$  are opposite in direction.
7.  $\vec{AB} = (-3, 4)$ ,  $\vec{AC} = (-1, -9)$ ;  $\cos A = \frac{(-3, 4) \cdot (-1, -9)}{|(-3, 4)||(-1, -9)|} = \frac{3 - 36}{5\sqrt{82}} = \frac{-33}{5\sqrt{82}}$ ;  
 $\angle A \approx 136.8^\circ$
8. a.  $AB = \sqrt{(4 + 6)^2 + 2^2 + (7 + 5)^2} = \sqrt{100 + 4 + 144} = \sqrt{248} = 2\sqrt{62}$   
 b.  $(\frac{4 - 6}{2}, \frac{0 - 2}{2}, \frac{-5 + 7}{2}) = (-1, -1, 1)$
9. a. If parallel, the direction vectors are scalar multiples of each other. The direction vector for  $L$  is  $(4, -1, -3)$ , so  $(x, y, z) = (2, 1, 7) + t(4, -1, -3)$   
 b.  $(x, y, z) = (4t, -1 - t, 6 - 3t)$ ;  $y = 0$  in  $xz$ -plane, so  $-1 - t = 0$ ;  $t = -1$ ;  $(-4, 0, 9)$
10.  $x^2 + (y + 1)^2 + (z - 3)^2 = 33$  has center  $C(0, -1, 3)$ .  $P(2, -3, -2)$  and  $\vec{PC}$  is perpendicular to the tangent plane;  $\vec{PC} = (-2, 2, 5)$ ;  $-2x + 2y + 5z = (-2)(2) + 2(-3) + 5(-2) = -20$ ;  $2x - 2y - 5z = 20$

5. a.  $\mathbf{v} = (2, -3)$ ,  $|\mathbf{v}| = \sqrt{13}$     b.  $x = 1 + 2t$ ,  $y = 3 - 3t$   
 c. At time  $t = -\frac{7}{8}$ , the object is at point  $(-\frac{3}{4}, \frac{45}{8})$  on the parabola. Also, at time  $t = 1$ , the object is at point  $(3, 0)$  on the parabola.
6. If  $\theta$  is the angle between  $\mathbf{u}$  and  $\mathbf{v}$ , then  $\mathbf{u} \cdot \mathbf{v} = |\mathbf{u}||\mathbf{v}| \cos \theta$  implies that  $\cos \theta = 1$ , or  $\theta = 0^\circ$ . Thus,  $\mathbf{u}$  and  $\mathbf{v}$  have the same direction.
7.  $28.1^\circ$     8. a. 13    b.  $(\frac{1}{2}, -2, 1)$
9. a.  $(x, y, z) = (2, 1, 7) + t(4, 1, 3)$     b.  $(4, 0, 9)$
10.  $x + 2y + 7z = 35$