Math 115
Answers to Practice Problems for Final Exam, I

1. (a) 9
(b) There is a right angle at B.
(c) \( (2,4,-5) \)
(d) \( \frac{3\sqrt{5}}{2} \)

2. (a) \[
\begin{pmatrix}
1 & 10 & 13 \\
-4 & -6 & -4 \\
\end{pmatrix}
\]
   \( A + B \) can’t be done because \( A \) and \( B \) don’t have the same number of rows.
   \( BA \) can’t be done because the number of columns of \( B \) is not equal to the number of rows of \( A \).
(b) \(-6\)
(c) \( x = 2/3, \ y = 3, \ z = -8/3 \)

3. (a) \( x = -3 + 3t, \ y = 7 - 4t, \ z = 5 + 2t \)
(b) \(-x + 2y + 10z = -14 \)

4. (a) \( x = -4 + 8t, \ y = -2 + 2t \)
(b) See part II of answers.

5. (a) \( 2\pi \sqrt{10} \)
(b) \( \mathbf{v}(0) = \langle 0, -1, 3 \rangle \)
(c) \( \mathbf{a}(0) = \langle -9, 0, 0 \rangle \)
(d) \( \langle 0, 0, 0 \rangle \)

6. See part II of answers.

7. \(-6x + 18y - z = 69 \)
(b) All points of the form \((2, b, 0)\) and \((a, 3, 0)\) where \( a \) and \( b \) can be any real numbers.

8. (a) \( (1, 0) \)
(b) saddle point

9. (a) \( \frac{-14}{\sqrt{5}} \)
(b) She will go downhill because the directional derivative is negative.
(c) \( \langle \frac{2}{\sqrt{13}}, \frac{3}{\sqrt{13}} \rangle \)

10. The fact that the speed is constant means that \( ||\mathbf{v}(t)|| \) is constant. From a property proved in class it follows that \( \mathbf{v}(t) \) and \( \mathbf{v}'(t) \) are orthogonal for all values of \( t \). Since \( \mathbf{v}'(t) = \mathbf{a}(t) \), this means that \( \mathbf{v}(t) \) and \( \mathbf{a}(t) \) are orthogonal for all values of \( t \).