

# Math 32A Practice Midterm 1

Joseph Breen

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Name: \_\_\_\_\_

ID: \_\_\_\_\_

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Question	Points	Score
1	10	
2	10	
3	10	
4	10	
Total:	40	

1. For each of the following statements, answer TRUE or FALSE. No justification required! Read carefully!!
- (a) (2 points) Suppose that  $\mathbf{v}$  and  $\mathbf{w}$  are parallel vectors and that  $\mathbf{p} \neq \mathbf{q}$  are different vectors. Then  $\mathbf{r}_1(t) = \mathbf{p} + t\mathbf{v}$  and  $\mathbf{r}_2(t) = \mathbf{q} + t\mathbf{w}$  are parameterizations for different lines.
  - (b) (2 points) A parameterization for the unit circle is  $\mathbf{r}(t) = \langle \sin(t^2), \cos(t^2) \rangle$ .
  - (c) (2 points) If  $\text{proj}_{\mathbf{b}} \mathbf{a} = \mathbf{0}$ , then  $\|\mathbf{a} \times \mathbf{b}\|$  is a positive number.
  - (d) (2 points) If  $\mathbf{a} \cdot \mathbf{b} > 0$ , then  $\mathbf{a} \times \mathbf{b} = \mathbf{0}$ .
  - (e) (2 points) The area of the triangle spanned by vectors  $\mathbf{a}$  and  $\mathbf{b}$  is the same as the area of the triangle spanned by vectors  $\mathbf{a}$  and  $\mathbf{b} - \mathbf{a}$ .

**Answers:**

- (a)
- (b)
- (c)
- (d)
- (e)

2. Let  $\mathbf{r}_1(t) = \langle 1 + t, 1 - t, 2t \rangle$  and  $\mathbf{r}_2(t) = \langle t - 1, 2t - 6, 3t - 7 \rangle$  represent the paths of two particles  $p_1$  and  $p_2$ .

(a) (5 points) Do the paths of  $p_1$  and  $p_2$  cross? Do the particles intersect each other?

(b) (5 points) Suppose that  $p_1$  and  $p_2$  begin their journey at  $t = 0$ . Which particle is the first to reach the plane  $x - 2y = 9$ ?

3. Consider the plane  $P$  given by  $x + 2y + 3z = 1$ .
- (a) (4 points) Find a parameterization of the line passing through the origin which is perpendicular to the plane  $P$ .
- (b) (6 points) Find an equation of a plane which contains the line you found in the previous part and is perpendicular to the plane  $P$ .

4. Let  $\mathbf{a}$  and  $\mathbf{b}$  be unit vectors such that  $\|\mathbf{a} + \mathbf{b}\| = \sqrt{2 + \sqrt{2}}$ .

(a) (4 points) Compute  $\|\mathbf{a} - \mathbf{b}\|$ .

(b) (2 points) What is the angle between  $\mathbf{a} + \mathbf{b}$  and  $\mathbf{a} - \mathbf{b}$ ?

(c) (4 points) Compute  $\|\mathbf{a} \times \mathbf{b}\|$ .