Name________________________

MATH 221 Exam 1 Version A Fall 2019

Section 504 P. Yasskin

1-9	/54	11	/15
10	/36	Total	/105

Multiple Choice: (6 points each. No part credit.)

1. Find the angle between the vectors $\vec{a} = \langle 1,2,1 \rangle$ and $\vec{b} = \langle 0,1,1 \rangle$.

a. $0°$

b. $30°$

c. $45°$

d. $60°$

e. $90°$

2. Two tugboats are pulling on a barge with the forces:

$$\vec{F}_1 = \langle 4,2 \rangle \quad \text{and} \quad \vec{F}_2 = \langle -2,1 \rangle$$

They move the barge from $P = (1,0)$ to $Q = (2,4)$. Find the work done.

a. 20

b. 18

c. 16

d. 14

e. 12

3. If $\vec{u}$ points West and $\vec{v}$ points NorthEast, where does $\vec{u} \times \vec{v}$ point?

a. Down

b. Up

c. SouthWest

d. SouthEast

e. South

4. If $|\vec{u}| = 2$, $|\vec{v}| = 5$ and $\vec{u} \cdot \vec{v} = 6$, what is $|\vec{u} \times \vec{v}|$?

a. 64

b. 8

c. 6

d. 4

e. 2

5. Find the area of the triangle with vertices $A = (2,3,4)$, $B = (4,3,2)$ and $C = (4,2,4)$.

a. 12

b. $\sqrt{12}$

c. 6

d. $\sqrt{6}$

e. $\sqrt{3}$

6. Find a vector $\vec{w}$ of length 6 in the same direction as $\vec{v} = \langle 2,1,-2 \rangle$. The sum of its components is

a. 1

b. 2

c. 6

d. 8

e. 12

7. Classify the surface: $2x^2 - 8x - y^2 + 6y + z^2 = 2.$

a. Hyperbolic Paraboloid

b. Hyperbolic Cylinder

c. Hyperboloid of 1 sheet

d. Hyperboloid of 2 sheets

e. Cone

8. Find the point where the line $(x, y, z) = (1 + 3t, 2 + 2t, 3 + t)$ intersects the plane $2x - y + z = 13.$ The sum of the components is:

a. -6

b. 6

c. 12

d. 18

e. No intersection. They are parallel.

9. Find the plane through the point $P = (0, 5, 3)$ with tangent vectors $\vec{u} = \langle 2, 1, 3 \rangle$ and $\vec{v} = \langle -1, 2, -2 \rangle.$ Its z-intercept is:

a. $z = 5$

b. $z = 10$

c. $z = 20$

d. $z = 2$

e. $z = 4$

Work Out: (Points indicated. Part credit possible. Show all work.)

10. (36 points) For the curve $\vec{r}(t) = \langle t, 2e^t, e^{2t} \rangle$ compute each of the following:

a. (6 pts) The velocity $\vec{v}$

$\vec{v} =$ ______________________

b. (6 pts) The speed $\dfrac{ds}{dt}$ (Simplify!)

$\dfrac{ds}{dt} =$ ______________________

c. (6 pts) The tangential acceleration a_T

$a_T =$ ______________________

d. (6 pts) The length of this curve between $(0,2,1)$ and $(1,2e,e^2)$

$L =$ ______________________

e. (6 pts) The mass of a wire in the shape of this curve between $(0,2,1)$ and $(1,2e,e^2)$ if the linear mass density is $\delta = yz$.

$M =$ ______________________

f. (6 pts) The work done to move a bead along of a wire in the shape of this curve between $(0,2,1)$ and $(1,2e,e^2)$ by the force $\vec{F} = \langle 0, z, y \rangle$.

$W =$ ______________________

11. (15 points) Consider the two straight lines:

$$L_1 : \qquad (x,y,z) = (2+t, 3, 4+2t)$$

$$L_2 : \qquad (x,y,z) = (1, 2+t, 3-2t)$$

Are they parallel or skew or do they intersect? If they intersect, find the point of intersection.