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MATH 221 Exam 1 Version H Fall 2019

Section 204 P. Yasskin

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

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

- Find the angle between the vectors $\vec{a} = \langle 1, 2, 1 \rangle$ and $\vec{b} = \langle 0, 1, 1 \rangle$.
 - 90°
 - 60°
 - 45°
 - 30°
 - 0°

- Two tugboats are pulling on a barge with the forces: $\vec{F}_1 = \langle 4, 2 \rangle$ and $\vec{F}_2 = \langle -2, 1 \rangle$. They move the barge from $P = (1, 0)$ to $Q = (2, 4)$. Find the work done.
 - 12
 - 14
 - 16
 - 18
 - 20

- Is the permutation $p = (3, 5, 2, 6, 1, 4)$ odd or even? Find its inverse permutation.
 - Odd $\bar{p} = (5, 3, 1, 6, 2, 4)$
 - Odd $\bar{p} = (4, 2, 6, 1, 3, 5)$
 - Even $\bar{p} = (5, 3, 1, 6, 2, 4)$
 - Even $\bar{p} = (4, 2, 6, 1, 3, 5)$

4. Compute the determinant: $D = \begin{vmatrix} 2 & 0 & 0 & 1 \\ 0 & 3 & 4 & 0 \\ 0 & 4 & 5 & 0 \\ 1 & 0 & 0 & 6 \end{vmatrix}$

- a. -11
- b. 11
- c. -13
- d. 13
- e. 0

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

- a. $\sqrt{3}$
- b. $\sqrt{6}$
- c. 6
- d. $\sqrt{12}$
- e. 12

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. 12
- b. 8
- c. 6
- d. 2
- e. 1.

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

- a. Hyperboloid of 1 sheet
- b. Hyperboloid of 2 sheets
- c. Cone
- d. Hyperbolic Paraboloid
- e. Hyperbolic Cylinder

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. $z = 2$
- b. $z = 4$
- c. $z = 5$
- d. $z = 10$
- e. $z = 20$

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}

$$\vec{v} = \underline{\hspace{10em}}$$

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

$$\frac{ds}{dt} = \underline{\hspace{10em}}$$

c. (6 pts) The tangential acceleration a_T

$$a_T = \underline{\hspace{10em}}$$

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

$$L = \underline{\hspace{10em}}$$

e. (6 pts) The average value of the temperature along this curve between $(0, 2, 1)$ and $(1, 2e, e^2)$ if the temperature is $T = yz$.

$$T_{\text{ave}} = \underline{\hspace{10em}}$$

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 $\vec{F} = \langle 0, z, y \rangle$.

$$W = \underline{\hspace{10em}}$$

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

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

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

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