Math 114
Exam # 1
Fall 2010

Name _____

TA _____

Recitation Day and Time _____

This exam has 1 matching, 4 multiple choice questions and 2 open-ended questions with all questions worth 10 points each for a total of 70 points. Partial credit will be given for the entire exam so be sure to show all work. On the matching question there is no need to justify your choice. On the multiple choice, circle the correct answer and give supporting work, a correct answer with little or no supporting work will receive little or no credit. Use the space provided to show all work. A sheet of scrap paper is provided at the end of the exam. If you write on the back of any page please indicate this in some way.

You have 50 minutes to complete the exam. You are not allowed the use of a calculator or any other electronic device. You are allowed to use the front and back of a standard 8.5"X11" sheet of paper for handwritten notes. Please silence and put away all cell phones and other electronic devices. When you finish, please stay seated until the entire 50 minutes has elapsed. When time is up continue to stay seated until someone comes by to collect your exam.

Do **NOT** write in the grid below. It is for grading purposes only.

Problem	Points
1	
2	
3	
4	
5	
6	
7	
Total	

1. Match the equation with the graph of the surface it defines.

_____1. $y^2 + z^2 = x^2$

_____2. $x = -y^2 - z^2$

_____3. $9y^2 + z^2 = 16$

_____4. $z^2 + x^2 - y^2 = 1$

_____5. $x = y^2 - z^2$

_____6. $x^2 + 2z^2 = 8$

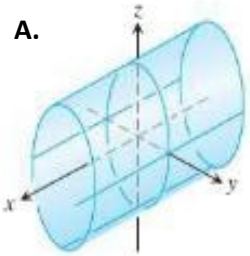
_____7. $x = z^2 - y^2$

_____8. $z^2 + 4y^2 - 4x^2 = 4$

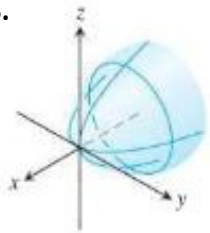
_____9. $x^2 + 4z^2 = y^2$

_____10. $x^2 + y^2 + 4z^2 = 10$

A.



B.



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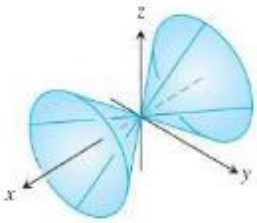

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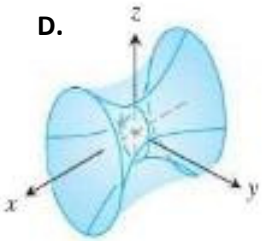

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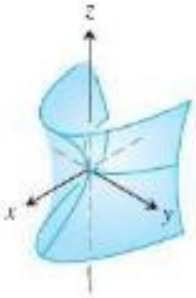
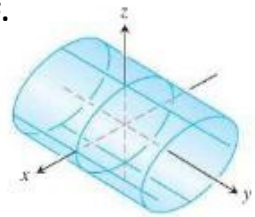
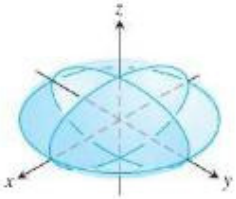


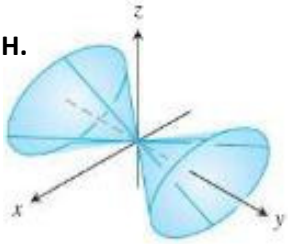
F.



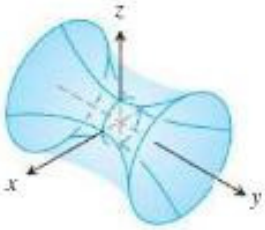
G.



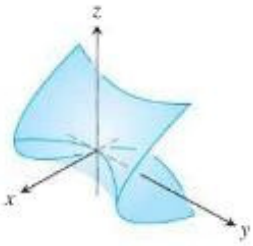
H.



I.



J.



2. If $\mathbf{b} = \langle 1,0,1 \rangle$, $\mathbf{c} = \langle 0,-1,1 \rangle$, and $\mathbf{a} = \langle 2,-3,k \rangle$, find the value of the constant k so that $\mathbf{a}, \mathbf{b}$, and $\mathbf{c}$ are coplanar.

a) -1 b) 0 c) 1 d) 2 e) 3 f) 4 g) 5 h) 6

3. Find the point on the plane $3x-2y+z=17$ closest to the point $(1,0,0)$. What is the $x-$coordinate of this point.

a) -2 b) -1 c) 0 d) 1 e) 2 f) 3 g) 4 h) 5

4. Find the arc length of the curve

$\mathbf{r}(t) = \langle t^2, \cos t + t\sin t, \sin t - t\cos t \rangle \quad \text{for } 0 \le t \le \sqrt{2}$

a) $\frac{1}{5}$ b) $\sqrt{5}$ c) $\frac{1}{\sqrt{5}}$ d) $3\sqrt{5}$ e) $\frac{\sqrt{5}}{5}$ f) $5\sqrt{5}$ g) 1 h) $\frac{3\sqrt{5}}{2}$

5. Find the curvature of

$\mathbf{r}(t) = \langle t^2, \cos t + t\sin t, \sin t - t\cos t \rangle$ when $t = 1$.

a) $\frac{1}{5}$ b) $\sqrt{5}$ c) $\frac{1}{\sqrt{5}}$ d) $3\sqrt{5}$ e) $\frac{\sqrt{5}}{5}$ f) $5\sqrt{5}$ g) 1 h) $\frac{3\sqrt{5}}{2}$

6. Let *L* be the line given by

$$\begin{aligned} x &= 2-t \\ y &= 1+t \\ z &= 1+2t \end{aligned}$$

L intersects the plane $2x+y-z=1$ at a point *P*. Find the parametric equations for the line through *P* which lies in the plane and is perpendicular to *L*.

Answer

$$\begin{aligned} x &= \boxed{} \\ y &= \boxed{} \\ z &= 3+3t \end{aligned}$$

7. Show that the vector $\mathbf{b} - \mathrm{proj}_{\mathbf{a}}\mathbf{b}$ is orthogonal to $\mathbf{a}$

a) using the dot product

b) geometrically

Scrap Paper