

Math 213 Calculus III

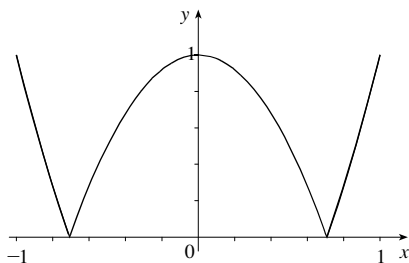
Reading the Text

Read Sections 9.7, 10.1-10.2 and answer the following questions

1. State a reason for introducing a different coordinate system for 3-dimensional space

2. What surface is given by the equation $\rho = 3$?

3. The following is a graph of the parametric curve $x(t) = \sin t, y(t) = |\cos 2t|, -\pi < t < \pi$:



Write an equation of a vector function which describes the same curve.

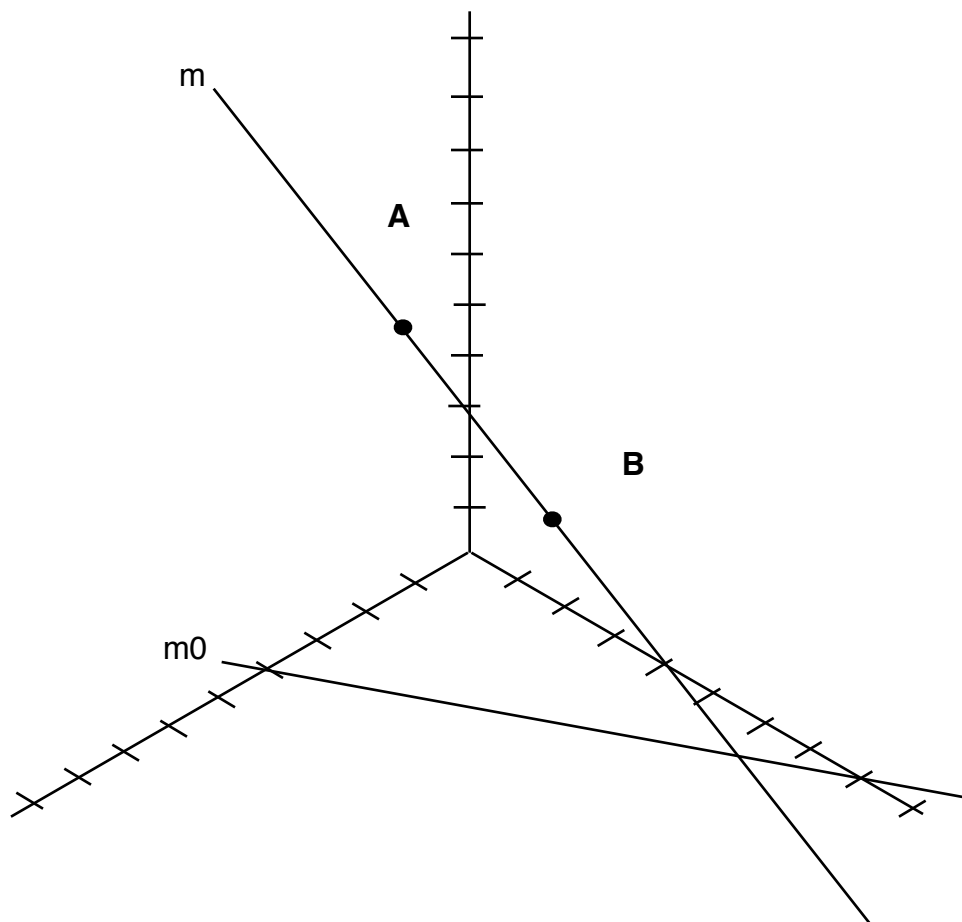
4. Sketch the curve described by the vector function $\langle \sin t, t \rangle$.

5. What is the difference between the *tangent vector* to a curve at a point P and the *unit tangent vector* to a curve at a point P ?

6. Are there any values of t for which the vector function $\mathbf{r}(t) = \langle t^2 - 2t, \sin \pi t + \pi t \rangle$ has a cusp? If so, find them. If not, why not?

Math 213 Class 03: Lines in 3D Space

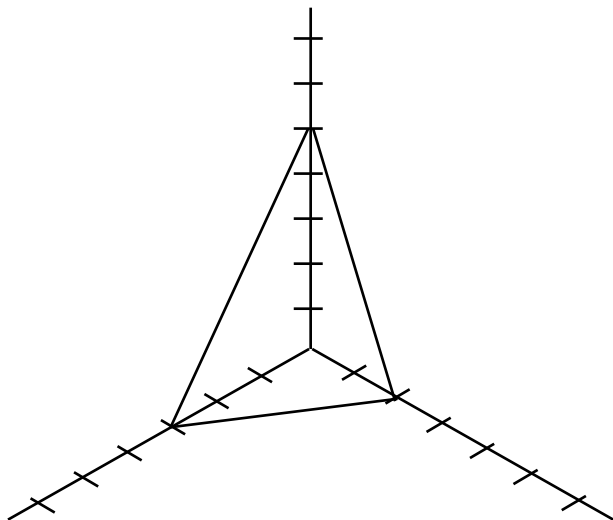
The line m in space is shown in the diagram below. The line m_0 in the xy plane is the *projection* of the line m onto the xy plane.



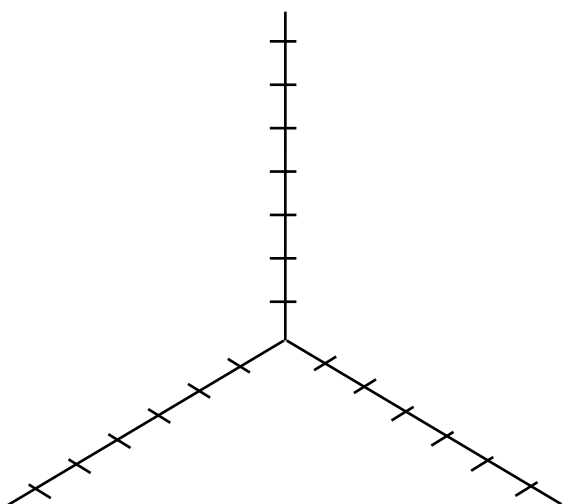
1. A and B are two points on m . Find their coordinates. (Requires some ruler work.)
2. Draw the points E, F, and G at which the line m intersects the xy plane, the xz plane, and the yz plane, and give estimates of the coordinates of E, F, and G.
3. Using all this information, give an equation for the line m .
4. Give an equation for the line m_0 .

Math 213 Class 03: Planes in 3D Space

Find the equation of the plane shown below.



2. Draw into the xyz system above the plane whose equation is:
 $4x+2y+8z=8$
3. On the graph, show the intersection of the two planes.
4. Find the equation of the line that is the intersection of the two planes.
6. Draw the plane $x+2y=4$ into the xyz system below.



Math 213 Class 03: Planes from points

Consider the point _____.

Find an equation of a line that contains your point and the origin.

Find an equation of a line that contains your point and the point $(1,-1,1)$.

Now find an equation of the plane that contains the two lines you've just found.

Find an equation of the plane that contains your point and is perpendicular to the x axis.

Find an equation of the plane that contains your point and is perpendicular to the line $y = x$ in the xy plane.

Finally, find an equation of a plane that does *not* contain your point.

Math 213 Class 03: Staying Cool

Let $T(x, y)$ be the temperature in a 10 ft by 10 ft room on a winter night, where one corner of the room is at $(0,0)$ and the opposite corner is at $(10,10)$. (We're ignoring vertical variations in temperature.) For each of the following functions T ,

- (a) Draw or describe in words a graph of the temperature function.
- (b) Describe the likely floor locations of the heating vents.
- (c) Suppose you like to sleep with a temperature of 70° or less. Where would you put the bed?

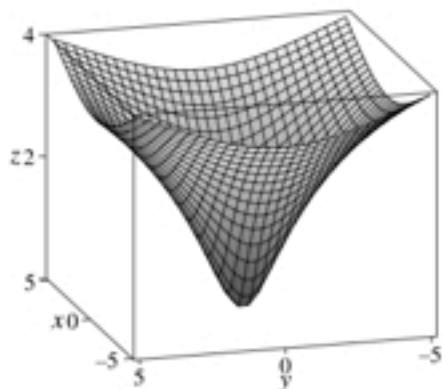
1. $T(x, y) = 78 - \frac{1}{10} [x^2 + (y - 5)^2]$

2. $T(x, y) = \frac{1}{2}x - y + 75$

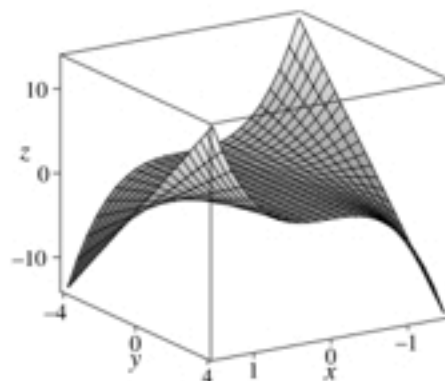
Group Work 2, Section 9.6
The Matching Game (General Functions)

Match each function with its graph. Give reasons for your choices.

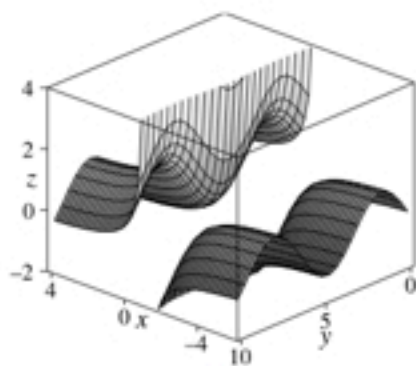
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|---------------------------------------|-------------------------------------|------------------------------|
| 1. $f(x, y) = \frac{1}{x+1} + \sin y$ | 2. $f(x, y) = \sqrt{4 - x^2 - y^2}$ | 3. $f(x, y) = \cos(x + y^2)$ |
| 4. $f(x, y) = \ln(x^2 + y^2 + 1)$ | 5. $f(x, y) = x^2\sqrt{y}$ | 6. $f(x, y) = x^3y$ |



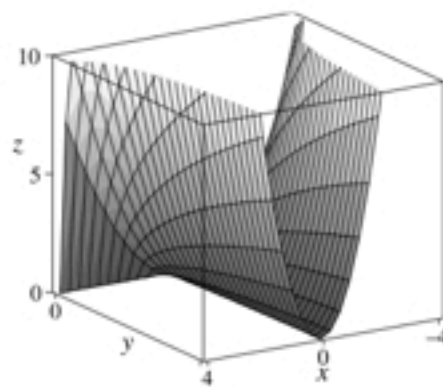
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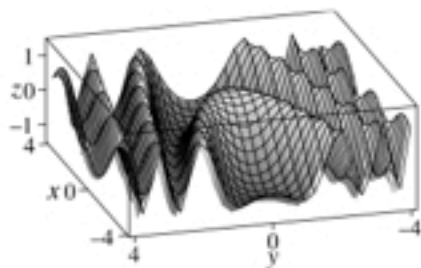
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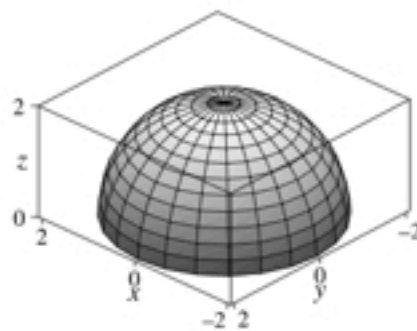
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VI

Group Work 3, Section 9.6
The Matching Game (Quadric Surfaces)

Match each function with its graph. Give reasons for your choices.

1. $x^2 + y^2 + \frac{1}{4}z^2 = 1$

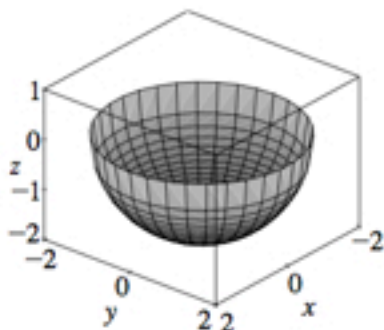
2. $z = -\sqrt{4 - x^2 - y^2}$

3. $y^2 + \frac{1}{4}z^2 = 1$

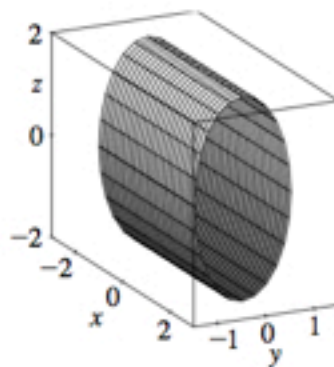
4. $\frac{1}{9}z^2 - \frac{1}{4}y^2 = 1$

5. $\frac{1}{4}x^2 - y^2 - z^2 = 1$

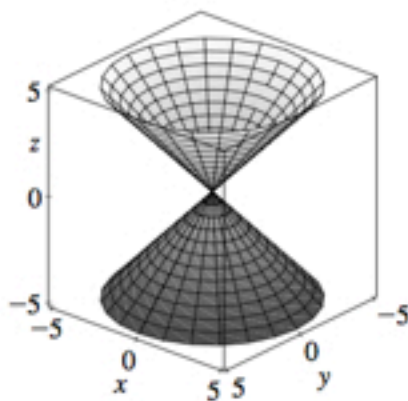
6. $|z| = \sqrt{x^2 + y^2}$



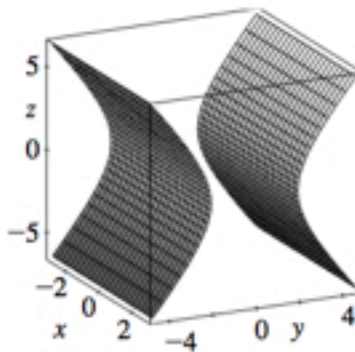
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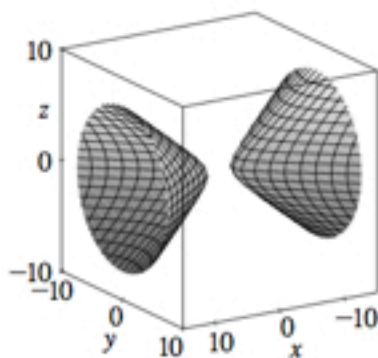
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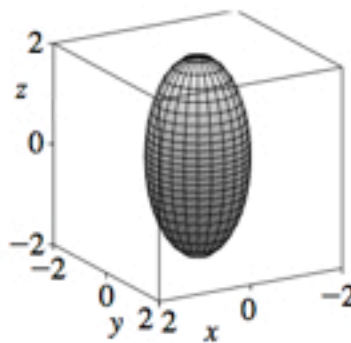
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