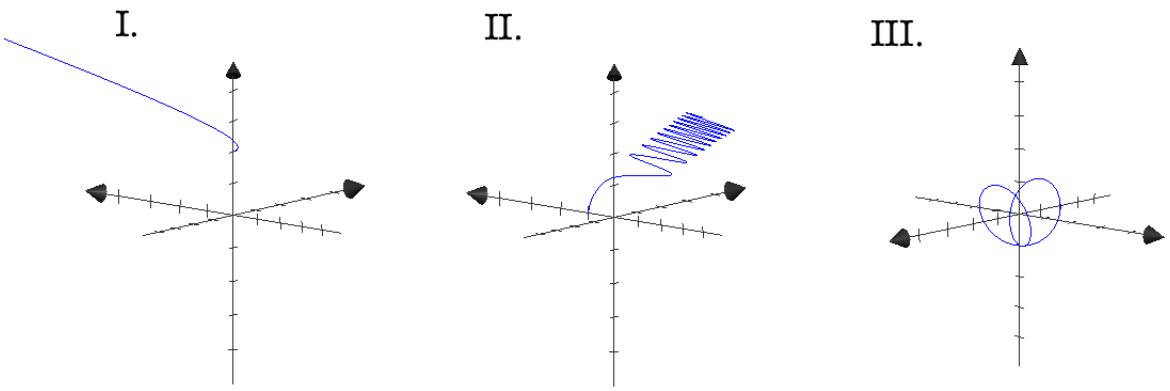
MATH 231: Calculus of Several Variables
Section 1, 107 Ag Sc & Ind Bldg,
TR 9:05 AM - 9:55 AM

Homework 6: Due Tuesday, Oct 1

1. Read the notes titled "Vector Functions and Space Curves"
2. Sketch the vector equation $\vec{r}(t) = \langle t, 1, t^2 \rangle$
3. Match the correct functions to the correct graphs. Write the domain of each function



   (a) $\vec{r}(t) = \left\langle \cos(t^3), t, \sqrt{t} \right\rangle$
   (b) $\vec{r}(t) = \langle t^2, t, 2 \rangle$
   (c) $\vec{r}(t) = \langle \cos t, \sin 2t, \cos 2t \rangle$

4. Find the domain of the following functions
   (a) $\vec{r}(t) = \left\langle \frac{\cos(\sqrt{t})}{1-t}, \frac{t^2-1}{(t-3)(t+1)}, \ln(t) \right\rangle$
   (b) $\vec{r}(t) = \left\langle \frac{1}{t}, \sqrt{t}, 1 \right\rangle \times \left\langle \frac{\sqrt{t}}{t-1}, t, 0 \right\rangle$ (this is a cross product!)

Some Review Questions

5. Which of the following pairs of planes are orthogonal to each other? (There may be more than one.)

   (a) $x - 2y + z = 4$ and $-x + y - z = 12$

   (b) $2x + y + z = 0$ and $-x + 2z = 1$

   (c) $x + 2y + 3z = 1$ and $x + y - z = 1$

   (d) $x + y + z = 1$ and $x - y + z = -1$

6. Consider the planes

$$P1 : 3x + ay + 9z = 3 \qquad P2 : x + 2y + 3z = 1$$

   where a is a constant. For what value of a will the two planes be parallel to each other?

7. Let m_1 and m_2 be two masses located at $\vec{r}_1$ and $\vec{r}_2$, respectively. Select which vector represents the center of mass

$$\frac{m_1\vec{r}_1 + m_2\vec{r}_2}{m_1 + m_2}$$

   if $\vec{r}_1 = \langle 1, 1, 0\rangle$, $\vec{r}_2 = \langle 2, 0, -1\rangle$, $m_1 = 2$, and $m_2 = 3$.

   (a) $\langle 7/5, 3/5, -2/5\rangle$

   (b) $\langle 8/5, 2/5, -3/5\rangle$

   (c) $\langle 3/5, 1/5, -1/5\rangle$

   (d) You can't calculate this expression

8. Which of the following best describes the surface defined by $x^2 + 20y^2 - 4z^2 + 4 = 0$

   (a) An ellipsoid

   (b) A sphere

   (c) A hyperboloid of one sheet

   (d) A hyperboloid of two sheets