## EXAM 1 - MATH 251 YOUR NAME:

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Find the length of the parametric curve  $x = \frac{t}{1+t}$ ,  $y = \ln(1+t)$ ,  $0 \le t \le 2$ .



2. Find the area of the region lying inside both polar curves  $r = 3\sin 2\theta$  and  $r = 3\sin \theta$ .



3. Consider the vectors  $\mathbf{a} = \langle 2, -1, 1 \rangle$  and  $\mathbf{b} = \langle 1, 0, -2 \rangle$ . Find the cosine of the angle formed by the vectors  $2\mathbf{a} + \mathbf{b}$  and  $3\mathbf{a} - \mathbf{b}$ .

4. Find a **unit vector** perpendicular to the plane determined by the points P(2,0,0), Q(0,1,0) and R(1,0,3).

5. Find the area of the triangle with vertices P(1,1,1), Q(-2,-1,-1) and R(-2,1,-2).