

Math 152, Fall 2007, Week 13

1. A curve is given parametrically by the equations:

$$x(t) = t^3 - 3t \quad \text{and} \quad y(t) = t^2 - t.$$

- a) Sketch x and y as functions of t , giving the intercepts and critical points of each function.
- b) Sketch the curve, labelling the points where the curve crosses the x -axis and the y -axis.
- c) Locate (exactly!) the points on the curve where the tangent to the curve is parallel to the x -axis; parallel to the y -axis; parallel to the line $y = x$.

2. Find the Cartesian coordinates of all points of intersection of the curves with polar equations $r^2 = 4 \sin \theta$ and $r = 1 - \sin \theta$. (Warning: $(0, \theta_1)$ and $(0, \theta_2)$ represent the same point *always*; also, so do (r, θ) and $(-r, \theta \pm \pi)$.)

3. Sketch the cardioid $r = 1 - \sin \theta$. What percentage of its enclosed area lies above the x -axis?