

### Test 3 Study Guide

#### Sections 11.1-11.2

- Graphing parametric eqns by finding Cartesian eqn and by plotting points (see #'s 7-14 pg 629).
- Cycloid:  $x = R(t - \sin t)$ ,  $y = R(1 - \cos t)$ .
- $\frac{dy}{dx} = \frac{y'(t)}{x'(t)}$ ,  $\frac{d^2y}{dx^2} = \frac{(x'(t)y''(t) - y'(t)y''(t))}{(x'(t))^3}$
- Finding points where the curve has horizontal and/or vertical tangents.
- Arc-length:  $L = \int_{\alpha}^{\beta} \sqrt{\left(\frac{dy}{dt}\right)^2 + \left(\frac{dx}{dt}\right)^2} dt$ .
- Speed:  $\sqrt{\left(\frac{dy}{dt}\right)^2 + \left(\frac{dx}{dt}\right)^2}$ .

#### Sections 11.3-11.5

- Know how to switch from polar to Cartesian coordinates.
- Sketching polar curves  $r = f(\theta)$  (see the table on pg 645).
- Areas and arc-lengths of polar curves (see #'s 6-15 and 24-28 on pg 654-5).
- Be able to find the focus and vertex for parabolas, and foci, center, vertices, and axes (and asymptotes) for ellipses (or hyperbolas) (see #'s 33-39 pg 668).

#### Sections 12.1-12.2

- Know how to find the length/magnitude of a vector and the eqn of a sphere
- Unit vectors
- "Force problems" like #'s 58-59 pg 683.
- Finding the equations of lines (see #'s 35-40 pg 692).

#### Sections 12.3-12.4

- Use the dot product to find the angle between vectors
- "Projections" ( $= \text{proj}_v(u)$ ) and "components" of vectors.
- Use cross product to find orthogonal vectors (ie)  $u \times v$  is  $\perp$  to both  $u$  and  $v$ .
- "Scalar triple product" is the volume of a parallelepiped. This may be used to determine if four points are in the same plane (ie) if the volume of the parallelepiped determined by those points is 0 then the pts lie in the same plane.