Derivatives of Vector Functions (Section 3.7)

EXAMPLE 1
Sketch the following vector equations and include the direction of the curve. Find the equation of a unit tangent vector to the curve at the given value of $t$.

$r(t) = \langle t, t^2 \rangle, \quad t = 1$

$r(t) = \langle 2\cos t, 3\sin t \rangle, \quad t = \pi/2$

EXAMPLE 2
Find $r'(t)$ and the domain of $r(t)$ and $r'(t)$ for

$r(t) = \langle t^2 - 4, \sqrt{9-t} \rangle$
EXAMPLE 3
The position (in feet) of an object at time $t$ (in seconds) is given by $r(t) = \langle t, 25t - 5t^2 \rangle$

(a) Find the position, velocity, and speed at the time $t=1$

(b) When does the item strike the ground and with what speed?

EXAMPLE 4
Find the angle of intersection of the curves $r(t) = <1-t, 3+t^2>$ and $s(u) = <u-2, u^2>$. 