Calc 3 : Assignment 11

① Find velocity, acceleration, and speed, and draw those vectors for the specified value of t:

a) $\vec{r}(t) = \langle -\frac{1}{2}t^2, t \rangle$, $t = 2$

b) $\vec{r}(t) = 3\cos(t)\,\vec{i} + 2\sin(t)\,\vec{j}$, $t = \pi/3$

c) $\vec{r}(t) = \langle t, t^2, 2 \rangle$, $t = 1$

d) $\vec{r}(t) = \langle e^t \cos(t), e^t \sin(t), te^t \rangle$, $t = 0$

② Find velocity and position if:

a) $\vec{a}(t) = \langle 1, 2, 0 \rangle$, $\vec{v}(0) = (0,0,1)$, $\vec{r}(0) = \langle 1,0,0 \rangle$

b) $\vec{a}(t) = \langle 2, \sin(t), \cos(t) \rangle$, $\vec{v}(0) = \vec{0}$, $\vec{r}(0) = (0,1,0)$

③ If $\vec{r}(t) = \langle t^2, 5t, t^2 - 16t \rangle$, when is the speed a minimum?

④ A projectile is fired at initial speed of 500 m/sec and angle of 30°. Find the range of projectile, the max. height, and the speed at impact.

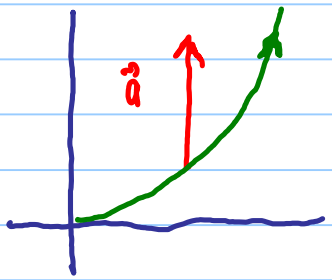
(5) Find the tangential and normal components of the acceleration:

a) $\vec{r}(t) = \langle 3t - t^3, 3t^2 \rangle$

b) $\vec{r}(t) = \langle \cos(t), \sin(t), t \rangle$

c) $\vec{r}(t) = \langle t, \cos^2(t), \sin^2(t) \rangle$

(6) In the picture below the acceleration vector is shown. Estimate the tangential and normal components of $\vec{a}$.



(7) The position of a space ship is

$$\vec{r}(t) = \langle 3+t, 2t \ln(t), 7 - \frac{4}{t^2+1} \rangle$$

and the coordinates of a space station are $(6, 4, 9)$. Captain Bert wants to coast into the station. When should he turn the engines off?