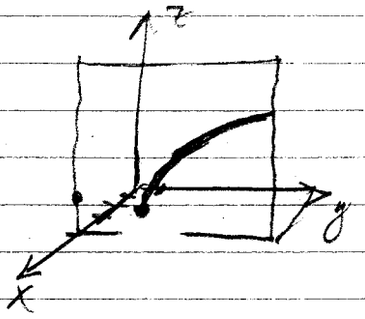
SM223 P02

1 (a) B (b) A

2. $\vec{r}(t) = \langle 3, t^2+1, t \rangle$



$x = 3$
$z = t$
$y = z^2 + 1$

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

$r'(t) = \langle -\sin t, \cos t, 2\cos 2t \rangle$

$2\cos 2t = 0$
$\cos 2t = 0$
$\therefore 2t = \frac{\pi}{2}$ or $\frac{3\pi}{2}$ etc
$t = \frac{\pi}{4}$ or $\frac{3\pi}{4}$ etc

4. $v(t) = \langle t+2, t^2, e^{-\frac{t}{3}} \rangle$

$r(0) = \langle 4, 0, -3 \rangle$

$\vec{r}(t) = \langle \frac{t^2}{2} + 2t + C_1, \frac{t^3}{3} + C_2, -3e^{-\frac{t}{3}} + C_3 \rangle$

$r(0) = \langle C_1, C_2, -3 + C_3 \rangle = \langle 4, 0, -3 \rangle$

$\therefore C_1 = 4 \quad C_2 = 0 \quad -3 + C_3 = -3 \text{ so } C_3 = 0$

$r(t) = \langle \frac{t^2}{2} + 2t + 4, \frac{t^3}{3}, -3e^{-\frac{t}{3}} \rangle$

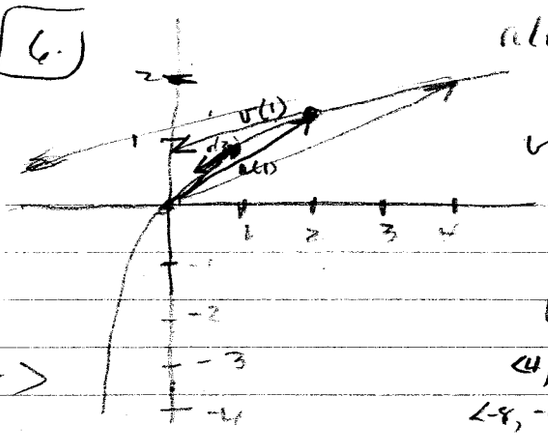
5. $r(t) = \langle \cos \pi t, \sin \pi t, \cos(4\pi t) \rangle$

$0 \le t \le 2$

$L = \int_0^2 \sqrt{(-\pi \sin \pi t)^2 + (\pi \cos \pi t)^2 + (-4\pi \sin 4\pi t)^2}\, dt = \int_0^2 \sqrt{\pi^2 + (-4\pi \sin 4\pi t)^2}\, dt$

$= 17.63$

6.

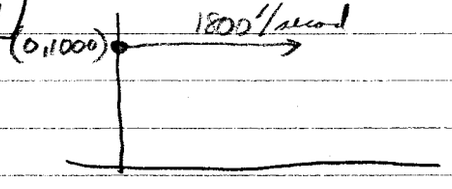


$r(t) = \langle \frac{2}{t}, \frac{3}{(t+1)} \rangle$

$v(t) = \langle \frac{-2}{t^2}, \frac{-3}{(t+1)^2} \rangle$

	$t = \frac{1}{4}$	$t = 1$	$t = 2$
$\langle 4, 2 \rangle$	$r(t)$ $\langle 2, 1.5 \rangle$	$\langle 2, 1 \rangle$	
$\langle -8, -12 \rangle$	$v(t)$ $\langle -2, -\frac{12}{5} \rangle$	$\langle -2, -\frac{3}{2} \rangle$	$\langle -\frac{1}{2}, -1 \rangle$

7.



$a(t) = \langle 0, -32 \rangle$
$v(t) = \langle 1800, -32t \rangle$
$\vec{r}(t) = \langle 1800t, -16t^2 + 1000 \rangle$
$16t^2 = 1000 \quad t^2 = \frac{1000}{16} = 62.5$
$t = 7.9$
$r(7.9) = 1800(7.9) = 14230.2$ ft

8. $\vec{a}(t) = \langle 0, -32 \rangle \quad r(0) = \langle 0, 5 \rangle$
$\vec{v}(t) = \langle \frac{v_0\sqrt{3}}{2}, -32t + \frac{v_0}{2} \rangle$
$\vec{r}(t) = \langle \frac{v_0\sqrt{3}}{2}t, -16t^2 + \frac{v_0}{2}t + 5 \rangle$
so $-16t^2 + \frac{v_0}{2}t + 5 = 0$
$-32t^2 + v_0 t + 10 = 0$
now $\frac{v_0\sqrt{3}}{2}t = 150$
so $t = \frac{150 \cdot 2}{v_0\sqrt{3}} = \frac{100\sqrt{3}}{v_0}$
sub in $-32t^2 + v_0 t + 10 = 0$
solve for v_0 and
$v_0 = 72.4$ ft/sec