Math 203 - HW5

12.3 #22. $\vec{r}(t) = \left(t, \sqrt{25-t^2}, \sqrt{25-t^2}\right)$, $t_0 = 3$

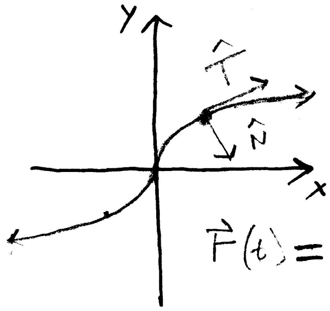
a) $\vec{r}\,'(t) = \left(1, \dfrac{-t}{\sqrt{25-t^2}}, \dfrac{-t}{\sqrt{25-t^2}}\right)$ $\quad \vec{r}\,'(3) = (1, -3/4, -3/4)$

$\vec{r}(3) = (3, 4, 4)$

$x(t) = 3 + t$
$y(t) = 4 - \frac{3}{4}t$
$z(t) = 4 - \frac{3}{4}t$

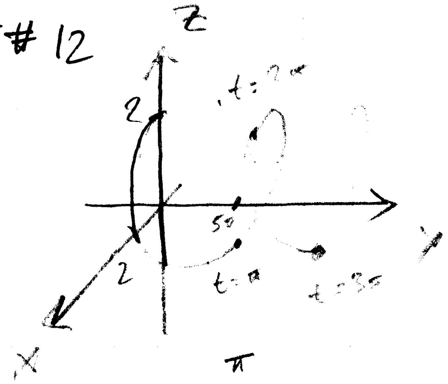
b) $\vec{r}(t_0 + 0.1) \approx (3.1, 3.925, 3.925)$

12.4 # 50.



$\vec{r}(t) = (t^3, t)$

12.5 # 12



$\vec{r}\,'(t) = (2\cos t, 5, -2\sin t)$

$s = \displaystyle\int_0^{\pi} \sqrt{4\cos^2 t + 25 + 4\sin^2 t}\, dt = \boxed{\sqrt{29}\,\pi}$

12.5 #71. $y = 1 - x^3$ $\quad y' = -3x^2$ $\quad y'' = -6x$

$\kappa = \dfrac{|y''|}{\left(1+(y')^2\right)^{3/2}} = \dfrac{6x}{\left(1+9x^4\right)^{3/2}}$

so $\kappa = 0$ when $x = 0$, and so $y = 1$.

$\boxed{(0,1)}$

12.5 # 86.

a) $f'(0) = f''(0) = 1$

$z = 2$

$(\alpha, \beta) = (0-2, 1+2) = (-2, 3)$

b) $y = \dfrac{x^2}{2}$ $\quad f'(1) = 1$ $\quad f''(1) = 1$

$z = 2$ $\quad (\alpha, \beta) = \left(1 - 2, \frac{1}{2} + 2\right)$

$= (-1, 5/2)$

c) $y = x^2$ $\quad f'(0) = 0, f''(0) = 2$

$z = 1/2$

$(\alpha, \beta) = (0, 1/2)$