

# SHORT ANSWERS TO

REVIEW PROBLEMS FOR EXAM #1, 251-04-05-06, FALL 2005

1.  $8x + 3y - 3z = 2$ , and  $A = 5\sqrt{82}/2$
2.  $5\pi$
3.  $x = 2t + 2$ ,  $y = -3t - 7$ ,  $z = t + 5$ .
4. 1
5.  $2x + y - z = 1$
6.  $a_{\text{tang}} = \cos(t/2)$ ,  $a_{\text{nor}} = \sin(t/2) = \sqrt{(1 - \cos t)/2}$ .
7.  $\frac{e^x}{(1 + e^{2x})^{3/2}}$ , max at  $x = -\frac{\ln 2}{2}$ .
8.  $\frac{1}{\sqrt{2}}(-\vec{i} + \vec{j})$ , and  $2/\sqrt{5}$ .
9.  $x^2y = 45$
10.  $\arccos \sqrt{2/3}$
11.  $\vec{r}'(t) = \left(\frac{t^2}{2} + 1\right)\vec{i} + (t+2)\vec{j} + \left(\frac{t^3}{3} + 1\right)\vec{k}$ ,  
 $\vec{r}(t) = \left(\frac{t^3}{6} + t\right)\vec{i} + \left(\frac{t^2}{2} + 2t\right)\vec{j} + \left(\frac{t^4}{12} + t\right)\vec{k}$ .
12.  $\vec{T}(t) = \frac{1}{\sqrt{t^4 + t^2 + 1}}(t^2\vec{i} + t\vec{j} + \vec{k})$  and  $\kappa = \sqrt{\frac{t^4 + 4t^2 + 1}{(t^4 + t^2 + 1)^3}}$ .
13.  $\theta = \arccos(1/6)$ , and  $x = 1 + 5t$ ,  $y = t$ ,  $z = -3t$ .
14. Does not exist.
15.  $\frac{dF}{dt} = \frac{c}{(h+R)^2} \frac{dm}{dt} - \frac{2cm}{(h+R)^3} \frac{dh}{dt}$ .
16.  $\frac{\partial z}{\partial s} = 4xs \sin y + 2x^2t \cos y$  and  $\frac{\partial z}{\partial t} = 4xt \sin y + 2x^2s \cos y$
17.  $c = 4$ . (Start with  $\frac{\partial z}{\partial u} = \frac{\partial z}{\partial x} \cdot 2u + \frac{\partial z}{\partial y} \cdot 2v$ , etc.)
18.  $dz = e^{(y/x)}(1 - (y/x)) dx + e^{(y/x)} dy$
19.  $y - z = 0$  and  $y - z = 1$ .