Worksheet #8; date: 02/13/2018
MATH 53 Multivariable Calculus

1. *(Stewart 13.2.21)* If $\mathbf{r}(t) = \langle t, t^2, t^3 \rangle$, find $\mathbf{r}'(t)$, $\mathbf{T}(1)$, $\mathbf{r}''(t)$, and $\mathbf{r}'(t) \times \mathbf{r}''(t)$.

2. *(Stewart 13.2.27)* Find a vector equation for the tangent line to the curve of intersection of the cylinders $x^2 + y^2 = 25$ and $y^2 + z^2 = 20$ at the point $(3, 4, 2)$.

3. *(Stewart 13.2.33)* The curves $\mathbf{r}_1(t) = \langle t, t^2, t^3 \rangle$ and $\mathbf{r}_2(t) = \langle \sin t, \sin 2t, t \rangle$ intersect at the origin. Find their angle of intersection, and leave the answer as an inverse trigonometric function.

4. *(Stewart 13.2.41)* Find $\mathbf{r}(t)$ if $\mathbf{r}'(t) = 2t\mathbf{i} + 3t^2\mathbf{j} + \sqrt{t}\mathbf{k}$ and $\mathbf{r}(1) = \mathbf{i} + \mathbf{j}$.

5. *(Stewart 13.3.3)* Find the length of the curve.

$$\mathbf{r}(t) = \sqrt{2}t\mathbf{i} + e^t\mathbf{j} + e^{-t}\mathbf{k}, \quad 0 \le t \le 1.$$

6. *(Stewart 13.3.13)* For the curve

$$\mathbf{r}(t) = (5 - t)\mathbf{i} + (4t - 3)\mathbf{j} + 3t\mathbf{k}$$

   and the point $P(4, 1, 3)$,

   (a) Find the arc length function for the curve measured fron the point P in the direction of increasing t and then reparametrize the curve with respect to arc length starting from P, and

   (b) find the point 4 units along the curve (in the direction of increasing t) from P.

7. *(Stewart 13.3.25)* Find the curvature of $\mathbf{r}(t) = \langle t, t^2, t^3 \rangle$ at the point $(1, 1, 1)$.

8. *(Stewart 13.3.31)* At what point does the curve have maximum curvature? What happens to the curvature as $x \to \infty$?

$$y = e^x.$$