Assignment 7 – Parts 1 & 2 – Math 243

Textbook exercises:[1]

Section 10.1: $2, 4, 6, 8, 10, 12$

Section 10.2: $18, 20$ (for these two problems, just find the slopes of the tangent lines, don't sketch anything)

Section 10.3: $18, 24, 26a, 26c$

Other exercises:

(1) Show that the points of the graph of $r = \sin(\theta)$ lie on a circle of radius $1/2$ centered at the point $(0, 1/2)$.

(2) Plot the set of points whose polar coordinates (r, θ) satisfy $2 \leq r \leq 3$ and $\pi/4 \leq \theta \leq 3\pi/4$.

(3) Find the area of the region bounded in polar coordinates by $0 \leq \theta \leq 2\pi$ and $0 \leq r \leq \theta^4$.

(4) Find the area of the region bounded in polar coordinates by $0 \leq \theta \leq \pi/4$ and $\cos(\theta) \leq r \leq 2\cos(\theta)$.

(5) Find the area of the region bounded in polar coordinates by $-\pi/6 \leq \theta \leq \pi/6$ and $\theta^2 \leq r \leq \cos(\theta)$.

(6) Evaluate the following limits $\lim_{t \to t_0} \mathbf{r}(t)$ for the following vector functions $\mathbf{r}(t)$ and numbers t_0.

(a) $\mathbf{r}(t) = (t, t^2, t^3)$, $t_0 = -2$

(b) $\mathbf{r}(t) = (\cos^2(t), 1 + \sin^2(t), \ln(1 + t))$, $t_0 = 0$

(c) $\mathbf{r}(t) = \left(\dfrac{\ln(1+t)}{t}, \dfrac{1 + \cos(t)}{1 + t^2}, t^3 + t - 2 \right)$, $t_0 = 0$

[1] From Hass, Weir, and Thomas' *University calculus: alternate edition*