MTH 32 LECTURE NOTES (Ojakian)

Topic 14: Polar Calculus

OUTLINE
(References: 7.4)

1. Area
2. Arclenth

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1. Area in polar coordinates

   Formula: Area $= \int_a^b (1/2)[f(\theta)]^2 d\theta$

   PROBLEM 1. *Consider the polar curve $r = 2\cos\theta$. What should its area be? Find the area with a polar integral.*

   ***PROBLEM* 2.** *Suppose d is some positive constant. Consider the polar curve $r = d\sin\theta$. What does d represent? What should its area be? Find the area with a polar integral.*

   ***PROBLEM* 3.** *Consider the polar curve $r = 2$. What should its area be? Find the area with a polar integral.*

   PROBLEM 4. *Consider the polar curve $r = 3\sin 2\theta$. It is a shape with 4 petals. Find the area of one petal with a polar integral.*

   ***PROBLEM* 5.** *From the* Work Book, *section 26: Do 5b and 5c.*

2. Arclength in polar coordinates

   Formula: Arclength $= \int_a^b \sqrt{(f(\theta))^2 + (f'(\theta))^2}\ d\theta$

   PROBLEM 6. *Consider the polar curve $r = 2\cos\theta$. What should its arclength be? Find the area with a polar integral.*

   ***PROBLEM* 7.** *Suppose d is some positive constant. Consider the polar curve $r = d\sin\theta$. What does d represent? What should its arclength be? Find the arclength with a polar integral.*

   ***PROBLEM* 8.** *Consider the polar curve $r = 2$. What should its arclength be? Find the arclength with a polar integral.*

   PROBLEM 9. *Consider the polar curve $r = 2 + 2\cos\theta$. Find the arclength.*

   ***PROBLEM* 10.** *From the* Work Book, *section 26: Do 9.*