Math 233 - November 5, 2009

- Polar Day (Part 2)

1. An apple pie has radius 3 units. You take a slice of pie that is quarter of the whole pie, $\Delta\theta = \pi/2$. What is the area of your slice of pie?

2. Same pie. Now your slice has $\Delta\theta = \pi/4$. What is the area of your slice of pie?

3. General pie with radius r and a slice with angle $\Delta\theta$. What is the area of your slice of pie?

Lecture Problems

4. Transform the following Cartesian equations into polar equations. (If possible, express r as a function of θ.)

   (a) $x = 1$

   (b) $x = 2$

   (c) $y = 0$

   (d) $y = 1$

   (e) $x^2 + y^2 = 16$

   (f) $x^2 + (y - 1/2)^2 = 1/4$

   (g) $(x - 1/2)^2 + y^2 = 1/4$

5. Use polar coordinates to compute

$$\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{1}{\sqrt{4 - x^2 - y^2}}\, dy\, dx =$$

6. Use polar coordinates to compute

$$\int_1^2 \int_0^{\sqrt{2x-x^2}} \frac{1}{\sqrt{x^2 + y^2}}\, dy\, dx =$$

7. Use rectangular coordinates to compute

$$\int_0^{\pi/4} \int_0^{\sec\theta} r^3 \sin^2\theta\, dr\, d\theta =$$