Name: _____

Class: _____

Due Date: _____

Physics Topic 7B – Center of Mass with Calculus

1. E: Consider a rod which has a length of $L = 56$ cm and which has a mass density which varies with length according to the formula $\lambda = (28 + 44l^2)$kg.

    a. What is the total mass of this rod?

b. Where is the center of mass of this rod?

2. E: Consider a rectangular plate $x = 35.0$ cm long and $y = 15.0$ cm wide where the surface mass density of the plate varies with the x-coordinate according to the equation $\sigma = (120 - 2800x^3)\frac{\text{kg}}{\text{m}^2}$.

   a. What is the total mass of this plate?

b. Where is the center of mass of this rectangular plate?

3. E: Consider a rectangular plate $x = 82.0$ cm long and $y = 22.0$ cm wide where the surface mass density of the plate varies with the x-coordinate according to $\sigma = (150 + 3600x^2) \frac{kg}{m^2}$. What is the total mass of this plate?

   a. What is the total mass of this plate?

b. What are the coordinates of the center of mass of this rectangular plate?

4. E: Consider a disc which has a radius of $R = 12.0$ cm and which has a mass density σ which varies with the radius of the disc according to the function $\sigma = (18.0 + 36r^2)\frac{\text{kg}}{\text{m}^2}$. What is the total mass of this disc?

5. E: Consider a thick ring with an inner radius of $r_1 = 6.00$ cm and an outer radius of $r_2 = 16.0$ cm where the mass per unit area varies according to $\sigma = (85.0 + 25.0r^2) \frac{kg}{m^2}$. What is the total mass of this ring?

6. E: Consider a disc which has a radius of $R = 18.0$ cm and which has a mass density which varies with the radius of the disc according to the function $\sigma = (18.0 + 5400r^3) \frac{\text{kg}}{\text{m}^2}$. What is the total mass of this disc?