

ANSWERS:

1. $\frac{\sqrt{57}}{8}$

2. $\frac{x}{(x^2 + 1)|x|}$

3. $2 \int_{-3}^2 \rho g(\sqrt{9-y})(2-y) dy$

4. (a) $M = \rho \int_0^2 \sqrt{1 - \frac{x^2}{4}} dx$

(b) $M_y = \rho \int_0^2 x \sqrt{1 - \frac{x^2}{4}} dx$

(c) $M_x = \frac{\rho}{2} \int_0^2 \left(1 - \frac{x^2}{4}\right) dx$

(d) $I_{(x=-3)} = \rho \int_0^2 (x+3)^2 \sqrt{1 - \frac{x^2}{4}} dx$

(e) $I_{(y=2)} = \frac{\rho}{3} \int_0^2 \left(\cancel{2^3} - \left(\sqrt{1 - \frac{x^2}{4}} \right)^3 \right) dx$

5. (a) $\theta = 2 \sin^{-1}(5/x)$ or $\theta = 2 \csc^{-1}(x/5)$

(b) θ is decreasing at a rate of $1/5\sqrt{3}$ radians per second.