32B Killip — Homework 2 — Due April 15

(1) From Section 11.2: Problem 74.

(2) Draw, then compute the length of the polar curve given by $r = e^{\theta}$ for $-2\pi \le \theta \le 2\pi$.

(3) From Section 16.4: 14, 28, 32, and 34.
(In 5th Ed: 16, 28, 32, and 34.)

(4) From Section 16.5: 16 and 28.
(In 5th Ed: 14 and 24.)

(5) Given $a, b > 0$, determine the center of mass of a homogeneous triangle with vertices $(0, 0)$, $(1, 0)$, and (a, b). Show that it lies at the intersection of the medians.

(6) Determine the center of mass of the homogeneous sector $0 \le \theta \le \pi/6$, $0 \le r \le 1$. Determine the moment of inertia of the sector for rotations about the axis passing though the center of mass and perpendicular to the plane of the sector.

(7) As in class, let

$$I(x_1, y_1) = \iint_D \big[(x - x_1)^2 + (y - y_1)^2\big]\, \rho(x, y)\, dA$$

denote the moment of inertia of a laminar body about the axis $x = x_1$, $y = y_1$, z arbitrary. If $(\bar{x}, \bar{y})$ denotes the center of mass and m denotes the total mass, show that

$$I(x_1, y_1) = I(\bar{x}, \bar{y}) + m\big[(\bar{x} - x_1)^2 + (\bar{y} - y_1)^2\big].$$