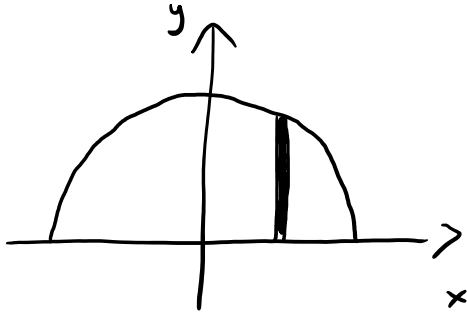


Section 29.4: Supplement cont'd

Wednesday, February 1, 2017 1:55 PM

Find the area of the semicircle by integration.



circle: $x^2 + y^2 = r^2$

top half has $y = \sqrt{r^2 - x^2}$

→ find the area of the first quadrant and multiply by 2

method #1 (rectangular)

$$A = \int_A dA$$

$$0 \leq x \leq R$$

$$0 \leq y \leq \sqrt{R^2 - x^2}$$

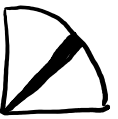
$$A = \int_0^R \int_0^{\sqrt{R^2 - x^2}} dy dx$$

$$= \int_0^R y \Big|_0^{\sqrt{R^2 - x^2}} dx$$

$$= \int_0^R \sqrt{R^2 - x^2} dx$$

you need a technique

method #2 (cylindrical)



$$0 \leq r \leq R$$

$$0 \leq \theta \leq \pi/2$$

$$A = \int_0^{\pi/2} \int_0^R r dr d\theta$$

$$= \int_0^{\pi/2} \frac{r^2}{2} \Big|_0^R d\theta$$

$$= \int_0^{\pi/2} \frac{R^2}{2} d\theta$$

$\pi/2$

you need a technique
here we
haven't learned

$$= \frac{R^2}{2} \theta \Big|_0^{\pi/2}$$

$$= \frac{\pi R^2}{4}$$