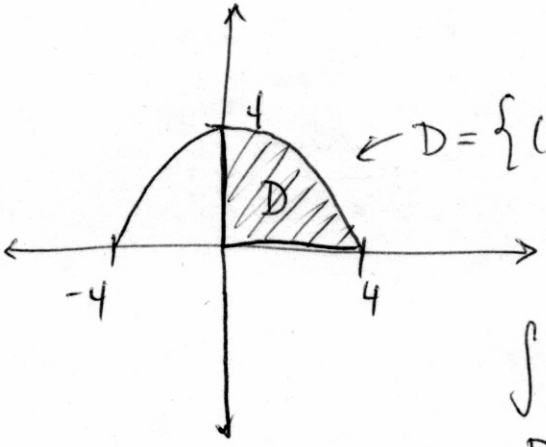
3. [20 points] Calculate the integral below where D is the region in the first quadrant bounded by $x = 0$, $y = 0$ and $x^2 + y^2 = 16$.

$$\iint_D (x^2 + y^2)^{3/2}\, dA$$



$D = \{(r, \theta) \mid 0 \le r \le 4,\ 0 \le \theta \le \pi/2\}$

$$\iint_D (x^2+y^2)^{3/2}\, dA$$

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

$$= \int_0^{\pi/2}\int_0^4 r^3 \cdot r\, dr\, d\theta = \int_0^{\pi/2}\int_0^4 r^4\, dr\, d\theta = \frac{\pi}{2} \cdot \frac{r^5}{5}\Big|_0^4$$

$$= \frac{\pi 4^5}{10} - 0$$