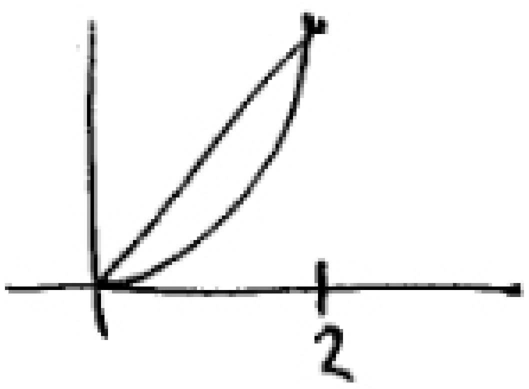
Math 132, Exam 1, February 7th

All questions carry equal marks. Choose the answer that is closest to the solution.

1. Find the volume obtained by rotating the region in the first quadrant between the curves $y = 2x^3$ and $y = 8x$ about the x-axis. The closest number is:

A. 300
B. 301
C. 302
D. 303
E. 304
F. 305
G. 306
H. 307
I. 308
J. 309



$$V = \int_0^2 \pi\left[(8x)^2 - (2x^3)^2\right] dx$$

$$= \pi\left[64\frac{x^3}{3} - 4\frac{x^7}{7}\Big|_{x=0}^{x=2}\right]$$

$$= 128\pi\left[\frac{4}{3} - \frac{4}{7}\right]$$

$$= 306.38\ldots$$

2. A solid lies between planes perpendicular to the x-axis at $x = 0$ and $x = 4.2$. The cross-sections perpendicular to the x-axis are squares whose diagonals run from the parabola $y = -\sqrt{x}$ to the parabola $y = \sqrt{x}$. What is its volume, to one decimal place?

A. 17.0
B. 17.1
C. 17.2
D. 17.3
E. 17.4
F. 17.5
G. 17.6
H. 17.7
I. 17.8
J. 17.9

$$V = \int_0^{4.2} [\text{Area of square with diagonal } 2\sqrt{x}]\, dx$$

$$= \int_0^{4.2} 2x\, dx$$

$$= x^2 \Big|_0^{4.2}$$

$$= 17.64$$

3. A curve is given parametrically by

$$x(t) = \frac{(2t+3)^{3/2}}{3}, \qquad y(t) = t + \frac{1}{2}t^2,$$

for $0 \le t \le 2$. What is its length?

A. 6.0
B. 6.1
C. 6.2
D. 6.3
E. 6.4
F. 6.5
G. 6.6
H. 6.7
I. 6.8
J. 6.9

$x' = \frac{1}{3}\frac{3}{2}(2t+3)^{\frac{1}{2}} \cdot 2 = (2t+3)^{1/2}$

$y' = 1 + t$

$L = \int_0^2 \sqrt{(x')^2 + (y')^2}\, dt = \int_0^2 \sqrt{2t+3+(1+2t+t^2)}\, dt$

$= \int_0^2 \sqrt{4+4t+t^2}\, dt$

$= \int_0^2 \sqrt{(2+t)^2}\, dt$

$= \int_0^2 (2+t)\, dt$

$= 2t + \frac{1}{2}t^2 \Big|_0^2$

$= 6$