Review Problems

January 13, 2017

1. (Fall 2004, Exam 1, #7) A solid S has a square base in the xy-plane given by $\{0 \leq x \leq 4, -2 \leq y \leq 2\}$. The cross-sections of S perpendicular to the x-axis are triangles with height $h(x) = x(4 - x)$. Find the volume of S.

2. (Fall 2006, Exam 1, #5) Find the area bounded by the curves $y = 6x^2$ and $y = 6x + 12$ in the interval $[0, 3]$.

3. (Fall 2006, Exam 1, #6) Find the area bounded by the curves $y = 12 - 6x^2$ and $y = 6|x|$.

4. (Fall 2006, Exam 1, #8) The volume of the solid obtained by rotating the region bounded by the curves $x = -y^2 + 2y$, $x = 1$, $y = 0$ and $y = 2$ about the line $x = 1$ is given by the integral

   (a) $\pi \int_0^1 (1 - y^2 + 2y)\, dy$
   (b) $\pi \int_0^2 (1 - y^2 + 2y)\, dy$
   (c) $\pi \int_0^2 (1 - y^2 + 2y)^2\, dy$
   (d) $\pi \int_0^1 (1 - y^2 + 2y)^2\, dy$
   (e) $\pi \int_0^2 (1 - y^2 + 2y)^2\, dy$

5. (Fall 2007, Exam 1, #6) The area of the region between the curves $y = \frac{x}{2} + 4$, and $x = y^2 - 4y$ is given by

   (a) $\int_{-4}^0 (y^2 - 4y - \frac{x}{2} - 4)\, dx$
   (b) $\int_{-4}^0 (\frac{x}{2} + 2 - \sqrt{4 + x})\, dx$
   (c) $\int_2^4 (6y - 8 - y^2)\, dy$
   (d) $\int_2^4 (7y - 8 - y^2)\, yx$
   (e) $\int_2^4 |y^2 - \frac{9y}{2} - 4|\, dy$

6. (Fall 2007, Exam 1, #7) The integral

$$\int_0^1 (\sqrt{x} - x)\, dx$$

   represents the area of the region bounded by the curves

(a) $y = x^2$ and $y = x$

(b) $x = y^2$ and $x = y$

(c) $x = y^2 - 2$ and $x = y$

(d) $y = 6x + 2$ and $y = x^2$

(e) $y = x^2$ and $y = 0$