MATH 140
FALL 2015 NAME:
EXAM 4

1. [5 pts. each] Suppose $\int_1^9 f(x)\,dx = -1$, $\int_7^9 f(x)\,dx = 5$, and $\int_7^9 h(x)\,dx = 4$. Evaluate the following.

   (a) $\displaystyle\int_1^7 f(x)\,dx$

   (b) $\displaystyle\int_9^7 [2h(x) - f(x)]\,dx$

2. [10 pts.] Use geometry to evaluate the definite integral:

$$\int_{-6}^{4} \sqrt{24 - 2x - x^2}\,dx.$$

3. [10 pts. each] Evaluate each definite integral using the Fundamental Theorem of Calculus.

   (a) $\displaystyle\int_{1/2}^{1} (x^{-3} - 8)\,dx$

   (b) $\displaystyle\int_0^{\pi/8} 3\sin(2x)\,dx$

4. [10 pts.] Simplify the expression:

$$\frac{d}{dx}\int_2^{x^5} \frac{4}{t^3}\,dt.$$

5. [10 pts. each] Use a change of variables to find the following.

   (a) $\displaystyle\int x^3(x^4 + 16)^6\,dx$

   (b) $\displaystyle\int \frac{y^2}{(y+1)^4}\,dy$

6. [15 pts.] Find the area of the region bounded by the curves $y = x^3$, $y = -x^3$, and $3y - 7x - 10 = 0$.

7. [15 pts.] Use the General Slicing Method to find the volume of the solid whose base is the triangle with vertices $(0, 0)$, $(2, 0)$, and $(0, 2)$, and whose cross sections perpendicular to the base and parallel to the y-axis are semicircles.

8. [15 pts.] Use the Disc Method to find the volume of the solid generated by revolving about the x-axis the region bounded by the curves $y = 1/x^2$, $y = 0$, $x = 1$, and $x = 4$.

9. [15 pts.] Find the length of the curve given by $y = \frac{1}{3}(x^2 + 2)^{3/2}$ for $x \in [1, 2]$.