Total Marks: 60
Due Date: **July 17, 2015**.

SHOW ALL WORK to get full marks. This assignment covers sections 4.7, 4.9, 5.1, 5.2, 5.3.

1. (5 points) What is the maximum vertical distance between the line $y = x - 3$ and the parabola $y = x^2$ for $-3 \leq x \leq 1$.

2. (5 points) A rectangular storage container with an open top is to have a volume of 10 m^3. The length of the base is twice the width. Material for the base costs \$5 per square meter. Material for the sides costs \$6 per square meter. Find the cost of the materials for the cheapest such container.

3. (6 points) Find the most general antiderivative of the function.
   (a) $r(\theta) = \frac{1}{2}e^{\theta} - \sec^2\theta + \sin(2\theta)$
   (b) $g(t) = \frac{1+t^2}{\sqrt{t}}$

4. (5 points) A particle is moving with the given data. Find the position of the particle.
$$a(t) = -\frac{1}{3}\cos t - 2\sin t, s(0) = -1, v(0) = 3$$

5. (5 points) Evaluate the integral by interpreting it in terms of areas.
$$\int_{-4}^{4} x - \sqrt{16 - x^2}\, dx$$

6. (4 points) If $\int_0^9 f(x)\, dx = 7$ and $\int_0^9 g(x)\, dx = 2$, Find
$$\int_0^9 [2f(x) + 3g(x) - 4]\, dx$$

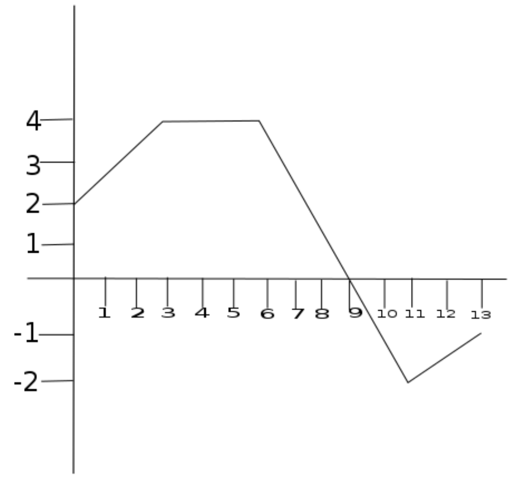
7. (9 points) Let $g(x) = \int_0^x f(t)\,dt$, where f is the function whose graph is shown.

   (a) Evaluate $g(0)$, $g(3)$, $g(6)$, $g(9)$ and $g(13)$

   (b) On what interval is g increasing?

   (c) Where does g have a maximum value?

   (d) Draw a rough sketch of g.



8. (7 points) Use Part 1 of the fundamental theorem of calculus to find the derivative of the function.

   (a) $y = \int_{\cos x}^{1} \sqrt{1+t^5}\,dt$

   (b) $g(x) = \int_{1-2x}^{1+2x} \sqrt{t}\tan t\,dt$

9. (6 points) Evaluate the integral.

   (a) $\int_0^{3\pi/4} \sec x \tan x\,dx$

   (b) $\int_{-2}^{1} x^{e^2} + e^x\,dx$

10. (4 points) Find the area of the region bounded by the graph of $f(x) = x^2 - 3$ and below the x-axis.

11. (4 points) Find the area of the region bounded by the graph of $f(x) = -(x+1)^2 + 9$ and above the x-axis.