Review of Sections 5.3, 5.4

1. Use Part 1 of the Fundamental Theorem of Calculus, to find the derivative os the functions.

   (a) $g(x) = \int_0^x \sqrt{t + t^3}\, dt$

   (b) $f(x) = \int_1^x \ln(1 + t^2)\, dt$

   (c) $g(x) = \int_x^0 \sqrt{1 + \sec t}\, dt$

   (d) $g(x) = \int_1^{e^x} \ln t\, dt$

(e) $g(x) = \int_{1}^{\sqrt{x}} \frac{t^2}{t^2+4}\, dt$

(f) $g(x) = \int_{\sqrt{x}}^{\pi/4} t \tan t \, dt$

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

(h) $g(x) = \int_{2x}^{3x} \frac{t^2 - 1}{t^2 + 1}\, dt$

(i) $g(x) = \int_{\sqrt{x}}^{2x} \arctan t\, dt$

(j) $g(x) = \int_{\cos x}^{\sin x} \ln(1 + 2t)\, dt$

2. Evaluate the integral

(a) $\displaystyle\int_{1}^{3} (x^2 + 2x - 4)\, dx$

(b) $\displaystyle\int_{0}^{2} \left(\frac{4}{5}t^3 - \frac{3}{4}t^2 + \frac{2}{5}t\right)\, dt$

(c) $\displaystyle\int_{0}^{1} (u + 2)(u - 3)\, du$

(d) $\displaystyle\int_{1}^{4} \frac{2 + x^2}{\sqrt{x}}\, dx$

(e) $\displaystyle\int_{\pi/6}^{\pi/2} \csc x \cot x \, dx$

(f) $\displaystyle\int_{0}^{1} (1+x)^3, dx$

(g) $\displaystyle\int_{1}^{3} \frac{x^3 - 2x^2 - x}{x^2} \, dx$

(h) $\displaystyle\int_{1/\sqrt{3}}^{\sqrt{3}} \frac{8}{1+x^2} \, dx$

(i) $\displaystyle\int_{0}^{4} (x^e + e^x + 3^x + x^3)\, dx$

(j) $\displaystyle\int_{1/2}^{1/\sqrt{2}} \frac{4}{\sqrt{1-x^2}}\, dx$

(k) $\displaystyle\int_{-1}^{2} (x - 2|x|), dx$

(l) $\displaystyle\int_{-2}^{2} f(x)\, dx$, where $f(x) = \begin{cases} 2, & \text{i}f \quad -2 \leq x < 0 \\ 4 - x^2, & \text{i}f \quad 0 \leq x \leq 2 \end{cases}$

3. Find the area of a region bounded by the graphs of

   (a) $y = \sqrt{x}$, $y = 0$, $x = 4$.

   (b) $y = 4 - x^2$, $y = 0$.

   (c) $y = 2x - x^2$, $y = 0$

4. A particle is moving along a straight line with the velocity

$$v(t) = t^2 - 2t - 3.$$

Find the total distance traveled during the time interval $0 \leq t \leq 3$.

5. A particle is moving along a straight line with the acceleration

$$a(t) = t + 4, \qquad v(0) = 5.$$

Find the total distance traveled during the time interval $0 \leq t \leq 10$.