1. Evaluate each of the following integrals.

(a) $\int (3x^2 + 2x + 1)dx$

(b) $\int \left(\frac{3}{t^3} + 2t + 1\right) dt$

(c) $\int 5 \sin z dz$

(d) $\int \frac{x^2 - 2x + 5}{\sqrt{x}} dx$

(e) $\int (2x + 3)^2 dx$

(f) $\int \frac{1}{\sin^2 y} dy$

(g) $\frac{d}{dx} \int (x^2 + 4)^5 dx$

(h) $\int \frac{d}{dx} \left(\tan(x^2 + 7)\right) dx$

2. (a) If $k$ is a constant then $\int k^3 dx =$

(b) $\int k^3 dk =$

3. Solve the differential equation subject to the given conditions.

(a) $f'(x) = x^2 + x$; $f(0) = 4$

(b) $\dfrac{dy}{dx} = \dfrac{1}{\sqrt{3x+1}}$; $y = 2$ when $x = 1$

(c) $g''(\alpha) = 3\cos\alpha - 2\sin\alpha$; $g'(\frac{\pi}{2}) = 5$; $g(\frac{\pi}{3}) = 4$

4. Jill throws a rock straight upward from ground level alongside a tree. The rock rises until it is even with the top of the tree then falls back to the ground. It remains aloft for 4 seconds. How tall is the tree? (Gravity produces a constant accelaration of 32 $ft/sec^2$.)

5. A car skids for 176 feet after its brakes are applied. It is determined that the deceleration provided by the cars braking system is a constant 22 feet per second per second. How fast was the car traveling (in miles per hour) when its brakes were applied?

6. Evaluate each of the following integrals.

(a) $\int (3x-2)^7 dx$

(b) $\int 6x^2(2x^3+3)^5 dx$

(c) $\int 3t\sqrt{4-3t^2}dt$

(d) $\int 5\sin^3 z \cos z dz$

(e) $\int \frac{6x}{(x^2+1)^4}dx$

(f) $\int 2w^2 \cos(4w^3)dw$