1. Find the exact value of each of the following.

$$(a) \cos^{-1}(1)$$

(d)
$$\tan^{-1}\left(\sqrt{3}\right)$$

(g)
$$\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$$
 (j) $\sin^{-1}\left(-\frac{1}{2}\right)$

$$(j) \sin^{-1}\left(-\frac{1}{2}\right)$$

(b)
$$\sec^{-1}(2)$$

(e)
$$\csc^{-1}\left(-\sqrt{2}\right)$$

(h)
$$\cos^{-1}\left(\frac{1}{2}\right)$$

$$(k) \tan^{-1}(0)$$

(c)
$$\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$$
 (f) $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$ (i) $\tan^{-1}(-1)$

(f)
$$\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$$

(i)
$$\tan^{-1}(-1)$$

$$(l) \sin^{-1}(2)$$

2. Find exact solutions to the following equation in the interval $[0, 2\pi)$.

$$2\cos^2(t) + 3\cos(t) + 1 = 0$$

3. Approximate the solutions to the following equation in the interval $[0, 2\pi)$ (to four significant figures).

$$6\cos^3(x) + 18\cos^2(x) - 5\cos(x) - 15 = 0$$

4. Find the derivative of each of the following.

(a)
$$y = \sec^{-1}(5x^2 - 2)$$

(c)
$$g(x) = \sin^{-1}(2x) + \sin(x^{-1}) + (\sin(2x))^{-1}$$

(b)
$$f(x) = x^3 \cos^{-1}(x)$$

(d)
$$y = \frac{\arctan(x)}{1 + x^2}$$

5. Evaluate the following integrals.

(a)
$$\int \frac{9}{x^2 + 4} dx$$

(d)
$$\int \frac{7}{x\sqrt{x^2 - 25}} dx$$

(b)
$$\int \frac{6x}{x^2 + 9} \, dx$$

(e)
$$\int \frac{e^{3x}}{\sqrt{1-e^{6x}}} dx$$

(c)
$$\int \frac{2}{\sqrt{16 - x^2}} \, dx$$

$$(f) \int \frac{1}{x\sqrt{x^4 - 1}} \, dx$$

6. (From the 200? AP Calculus AB exam) Let R be the region in the first and second quadrants bounded above by the graph of $y = \frac{20}{1+x^2}$ and below by the horizontal line y = 2. Find the area of R.

- 7. (From the 200? AP Calculus AB exam) A particle moves along the y-axis so that its velocity v at time $t \ge 0$ is given by $v(t) = 1 \tan^{-1}(e^t)$. At time t = 0, the particle is at y = -1.
 - (a) Find the acceleration of the particle at time t = 2.
 - (b) Is the speed of the particle increasing or decreasing at time t=2? Give a reason for your answer. (Note: Speed is the absolute value of velocity.)

(c) Find the time $t \ge 0$ at which the particle reaches its highest point. Justify your answer.