1. Compute the following limits.

(a) \[
\lim_{x \to \pi} \frac{\sin x}{1 - \cos x}
\]

(b) \[
\lim_{x \to 0} \frac{x - \sin x}{1 - \cos x}
\]

(c) \[
\lim_{x \to \frac{\pi}{2}} \sec (7x) \cos (3x)
\]

(d) \[
\lim_{x \to \infty} \frac{e^x}{x^3}
\]

(e) \[
\lim_{x \to 0^+} (\csc x)^x
\]

(f) \[
\lim_{x \to 4} \left( \frac{1}{\sqrt{x} - 2} - \frac{4}{x - 4} \right)
\]

(g) \[
\lim_{x \to \infty} (e^x + x)^{1/x}
\]

2. Evaluate the following integrals.

(a) \[
\int_1^3 \frac{2x + 1}{x^2 + x - 2} \, dx
\]

(b) \[
\int_2^7 \frac{1}{(x - 3)^{3/2}} \, dx
\]

3. A man falling with a parachute eventually attains a steady velocity. Assume his position with respect to time is given by

\[
s(t) = \frac{25}{2} (e^{-(8/5)t} - 1) + 20t.
\]

Distance is given in feet, and time is given in seconds. Determine his eventual steady-state velocity.
4. Evaluate the following integrals using the Integration Tables. Four more entries may be useful.

\[ \int \tan^n(ax) \sec^2(ax) \, dx = 1 \frac{1}{(n+1)a} \tan^{n+1}(ax) + C \]

\[ \int \sec^n x \tan x \, dx = \frac{1}{n} \sec^n x + C, \quad n \neq 0 \]

\[ \int \frac{u \, du}{\sqrt{2au - u^2}} = -\sqrt{2au - u^2} + a \cos^{-1} \left( \frac{a-u}{a} \right) + C \]

\[ \int \frac{u^2 \, du}{\sqrt{2au - u^2}} = -\frac{u + 3a}{2} \sqrt{2au - u^2} + \frac{3a^2}{2} \cos^{-1} \left( \frac{a-u}{a} \right) + C \]

(a) \[ \int \tan^5 x \sec^6 x \, dx \]

Hint: Use the identity \( 1 + \tan^2 x = \sec^2 x \).

(b) \[ \int \frac{x^3}{\sqrt{(2/3)x^2 - x^4}} \, dx \]

(c) \[ \int \frac{56 \, dw}{w^2 \sqrt{49 - w^2}} \]

(d) \[ \int 6x^2 \sqrt{6x^3 - x^6} \, dx \]

5. Consider the functions \( f(x) = e^x \) and \( g(x) = 2x \) between \( x = 0 \) and \( x = 2 \).

(a) Find the volume of revolution found by revolving the region about the \( x \)-axis.

(b) Find the volume of revolution found by revolving the region about the \( y \)-axis.

6. Evaluate the following integrals using Partial Fractions.

(a) \[ \int \frac{3x^2 - 5x + 56}{(x - 3)(x^2 + 25)} \, dx \]

(b) \[ \int \frac{x - 9}{(x + 5)(x - 2)} \, dx \]

(c) Expand out the following, but do not solve for the coefficients.

\[ \frac{1}{(x^2 + 4)(x - 3)^3} \]