1. (10 points) Suppose \( \int_{-8}^{-5} f(x)dx = 2, \int_{-8}^{-7} f(x)dx = 10, \int_{-6}^{-5} f(x)dx = 8. \)

(a) Find \( \int_{-7}^{-6} f(x)dx = \)

(b) \( \int_{-6}^{-7} (2f(x) - 10)dx = \)

2. (15 points) Given

\[
f(x) = \int_{0}^{x} \frac{t^2 - 4}{1 + \cos^2(t)}dt
\]

At what value of \( x \) does the local max of \( f(x) \) occur?
3. (24 points) Find the following indefinite integrals.

(a) \[ \int \cos^3 \theta \sin^3 \theta \, d\theta \]

(b) \[ \int (x - 1)^2 \, dx \]

(c) \[ \int \frac{2x}{x^2 + 1} \, dx \]

(d) \[ \int \frac{1}{\sqrt{4 - x^2}} \, dx \]
4. (64 points) Use the evaluation theorem as needed to find each of the definite and improper integrals below. Each improper integral must be identified as such to get credit.

(a) \[ \int_{0}^{2} \frac{d}{dx}[(x^2 - 3)(x^3 - 1)] \, dx \]

(b) \[ \int_{4}^{9} \frac{9}{\sqrt{x}} \, dx \]

(c) \[ \int_{0}^{\pi/2} \cos x \cos(\sin x) \, dx \]

(d) \[ \int_{3}^{4} \frac{x - 1}{x^2 - 4} \, dx \]
(e) \( \int_{e}^{\infty} (x \ln x)^{-1} \, dx \)

(f) \( \int_{1}^{4} |x^3 - 6x^2 + 11x - 6| \, dx \). Note that \( f(x) = x^3 - 6x^2 + 11x - 6 \) factors into \((x - 1)(x - 2)(x - 3)\).

(g) \( \int_{0}^{1} x(x - 2)^9 \, dx \)

(h) \( \int_{0}^{1} \frac{1}{\sqrt{x}} \, dx \)
5. (15 points) Construct a triangle with an acute angle $\theta$ such that $\tan \theta = x/2$. Then compute each of the following in terms of $x$.

(a) $\sin \theta$

(b) $\sin(2\theta)$

(c) $\csc \theta$

6. (15 points) For each integral below, use the substitution $\theta$ such that $x = 2 \tan \theta$ to find an equivalent $d\theta$ integral. Do not evaluate.

(a) $\int_{0}^{1} \frac{x^2}{\sqrt{4 + x^2}} \, dx$

(b) $\int \frac{1}{4 + x^2} \, dx$

(c) $\int x \sqrt{4 + x^2} \, dx$