Group Assignment #24

Practice with Anti-Derivatives and Integration

Determine the anti-derivative for the following functions.

1) \( k(x) = \frac{2x-1}{x^2-x+37} \)

2) \( j(x) = \frac{4\sqrt{x^5}}{} \)

3) \( p(x) = 13 \)

4) \( f(x) = 2\sqrt{x} - \frac{x^3}{2} \)

5) \( r(x) = 3x^2 + 2x + 1 \)
Carry out the following integrations.

6) \( \int 4xe^{x^2} \, dx \)

7) \( \int 6x(3x^2 + 1)^7 \, dx \)

8) \( \int_1^3 (x^2 - 2x) \, dx \)

9) \( \int_{-2}^3 x \, dx \)
10) Find the area of the figure bounded by $f(x) = \sqrt{x}$, $x = 4$, and the $x$-axis.

11) Find the area of the figure bounded by $f(x) = x^2 + 3$, $x = -1$, $x = 2$, and $y = 1$.

12) Find the area under the graph of $f(x) = \sqrt[4]{x}$, from $1 \leq x \leq 16$.

13) Find the area under the graph of $f(x) = 1 + x^4$, from $2 \leq x \leq 5$. 
For problems 5-7, evaluate the integrals given the function, \( f(x) \), below.

14) \( \int_0^5 f(x) \, dx \)

15) \( \int_5^9 f(x) \, dx \)

16) \( \int_0^9 f(x) \, dx \)

Evaluate the following integrals.

17) \( \int_2^{10} x^6 \, dx \)

18) \( \int_{-1}^{4} (3x^2 - 6x + 10) \, dx \)
19) \( \int (3x^5 - 2x - 1)\,dx \)

20) \( \int -2e^x\,dx \)

21) \( \int e^{-3x}\,dx \)

22) \( \int_1^3 \frac{x^4}{1+x^5}\,dx \)

23) \( \int 2xe^{4x^2}\,dx \)

24) \( \int_1^4 \frac{x-5}{x^2-10x+2}\,dx \)
25) \[ \int x^2 \sqrt{3 - 2x^3} \, dx \]

26) Suppose you are looking to buy a beachfront property in California, which is bordered by the ocean that can be represented by the function \( f(x) = (x - 2)^2 - 3 \), and by the highway Route 1 that can be represented by the function \( g(x) = 3x - 9 \). If \( x \) is in terms of 1000 feet, what is the area of this property in square feet? **Hint:** Draw a picture of the property.

(b) Would you be able to build a 2500 square foot ranch style (single floor) house on this property? If so, how large of yard would you have left in square feet? If not, how many more square feet would the beachfront property need to be in order to fit the house on it?
27) From the last exam we learned the tallest wave ever recorded was 1,720 ft. It occurred in Lituya Bay, AK on June 9, 1958. The wave moved at a velocity of over 93 mph. The wave height is described by the following function:

$$h(t) = -10t^2 + 240t + 280$$

Lituya Bay is roughly 8,500 ft. wide. Assuming the wave was the full length of the bay, how could you determine the volume of water contained in the wave from its initial formation of time $t = 0$ minutes to its return to sea level at time $t = 25$ minutes?

(b) Find the volume of water contained in the wave.