(1) Find the average value of the function $f(x) = \frac{32x}{\sqrt{2x^2 + 49}}$ on the interval $[0,4]$.

(2) Determine the $x$-coordinate for each inflection point of the following function.

$$g(x) = 8x + \int_x^9 e^t(t - 25) \, dt$$

(3) Suppose that $f(x)$ is a polynomial which satisfies the following conditions.

- $\int_2^9 f(x) \, dx = 30$
- $\int_4^9 f(x) \, dx = 34$

(a) Evaluate $\int_2^4 (8f(x) + 5) \, dx$

(b) Evaluate $\int_3^4 34xf(x^2 - 7) \, dx$
(4) Find the average value of the function \( f(x) = 3 \cos(x) + 5x^{10} \sin(x) \) on the interval \([-\pi/2, \pi/2]\). Simplify your answer.

(5) Determine the area of the finite region bounded by the graphs of \( x = 3y^2 + 18y \) and \( x = 6y \). Simplify your answer.

(6) Find all of the critical numbers for \( g(x) \).

\[
g(x) = \int_{2}^{x^5-5x^3+9} \frac{t - 9}{t^8 + 25} \, dt
\]
(7) Evaluate the following limit.

\[
\lim_{n \to \infty} \sum_{i=1}^{n} \left( \frac{60i}{n^2} + \frac{12}{n+5} \right)
\]

(8) Let \( R \) be the finite region bounded by the graphs of the following equations.

\[ v(x) = 3e^x \quad w(x) = 12e^{-x} \quad x = 0 \]

The graphs of \( v(x) \) and \( w(x) \) intersect at the point \((x, y) = (\ln(2), 6)\)

Set up, but DO NOT EVALUATE, definite integrals which represent the given quantities.

(a) The volume of the solid obtained when \( R \) is revolved around the vertical line \( x = -4 \). Set up the volume integral where you integrate with respect to \( x \).

(b) The volume of the solid obtained when \( R \) is revolved around the horizontal line \( y = 15 \). Set up the volume integral where you integrate with respect to \( x \). (a “\( dx \)” integral, same as above)
(9) Evaluate the following integrals.

(a) \[ \int \frac{x^5 + x^2}{4x^6 + 1} \, dx \]

(b) \[ \int \frac{x^3 + 2x^2 + 9x - 17}{x + 4} \, dx \]

(c) \[ \int 20x^9 (2x^5 + 1)^{100} \, dx \]

(d) \[ \int_{4/3}^{8/3} (3x - 6)^{15} \cos (3x - 6) \, dx \]
(e) \[ \int (\cos (6x) \sec (3x) + \sin^2 (3x) \sec (3x)) \, dx \]

(f) \[ \int \frac{10e^{2x} \cos(e^{2x})}{\sin^2(e^{2x}) + 1} \, dx \]

(g) \[ \int \frac{4x^{11}}{(x^4 + 2)^3} \, dx \]

(h) \[ \int_1^{e^2} \frac{24}{x \sqrt{9 + 8\ln(x)}} \, dx \]
(i) \[ \int 42e^{84x} (e^{42x} + 5)^{35} \, dx \]

(j) \[ \int \frac{42x^{13}}{x^{28} - 18x^{14} + 82} \, dx \]

(k) \[ \int \frac{1}{x^2 - 4x + 13} \, dx \] (Hint: Try completing the square.)

(10) The graph of \( f'(x) \) is shown below. On the empty set of axes, sketch the graph of the anti-derivative function \( f(x) \).