1. (10 points) Determine the absolute minimum \( y \)-value on the graph of \( y = 2e^{4x} - 648x + 38 \). Simplify your answer.

2. (10 points) A function \( g(x) \) has the following derivative.

\[
g'(x) = 5e^x(x - 1)^2(x - 2)^3(x - 3)^4
\]

Determine the \( x \)-value for each local maximum and local minimum on the graph of \( g(x) \).
3. (5 points) Precisely state Rolle’s Theorem.

4. (5 points) Evaluate the following limit. Be sure to use proper notation throughout your evaluation of this limit. Simplify your answer.

\[
\lim_{n \to \infty} \sum_{k=1}^{n} \left( \frac{17}{4n} - \frac{5k}{2n^2} \right)
\]
5. (10 points) When a thin circular plate of metal is heated in an oven, its radius increases at the rate of 0.01 centimeters per minute. At what rate is the plate’s area increasing when the radius is 80 centimeters?
6. (10 points) Which point on the graph of \( y = \sqrt{5x} \) is closest to the point \((10, 0)\)?
(5 points each) Evaluate the following limits:

7. \( \lim_{x \to 0} \frac{e^{6x} - 6x - \cos x}{x^2} \)

8. \( \lim_{x \to \infty} \left(1 - \frac{2}{x}\right)^{3x} \)
9. (5 points) If Newton’s Method is used to approximate a solution to the equation \( f(x) = 0 \), then it generates a sequence of approximations \( x_1, x_2, x_3, x_4, \ldots \). Which one of the following correctly shows how \( x_n \) can be used to determine the next approximation \( x_{n+1} \)?

(a) \( x_{n+1} = \frac{x_n + f'(x_n)}{f(x_n)} \)  
(b) \( x_{n+1} = x_n + \frac{f'(x_n)}{f(x_n)} \)

(c) \( x_{n+1} = \frac{x_n + f(x_n)}{f'(x_n)} \)  
(d) \( x_{n+1} = x_n + \frac{f(x_n)}{f'(x_n)} \)

(e) \( x_{n+1} = \frac{x_n - f'(x_n)}{f(x_n)} \)  
(f) \( x_{n+1} = x_n - \frac{f'(x_n)}{f(x_n)} \)

(g) \( x_{n+1} = \frac{x_n - f(x_n)}{f'(x_n)} \)  
(h) \( x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} \)

10. (5 points) Suppose that a polynomial \( g \) satisfies the following conditions.

- \( g(2) = 5 \)
- \( g'(2) = 3 \)
- \( g''(2) = 4 \)
- \( g'''(2) = 1 \)

Use a linear approximation to estimate the value of \( g(1.9) \). Simplify and write your answer in decimal form.
11. (10 points) Suppose $f$ is an even function, $g$ is an odd function, and $f$ and $g$ are each integrable on the interval $[-3, 3]$. Given that $\int_{-3}^{3} f(x) \, dx = 5$ and $\int_{-3}^{3} g(x) \, dx = 4$, evaluate the following definite integrals.

(a) $\int_{-3}^{0} g(x) \, dx$

(b) $\int_{-3}^{3} f(x) \, dx$

(c) $\int_{-3}^{3} (4f(x) - 3g(x)) \, dx$

(d) $\int_{-3}^{3} (2f(x) + 4g(x)) \, dx$
12. (10 points) Determine the formula for a function $f(x)$ such that $f''(x) = 12e^{2x} + \cos x$, $f'(0) = 1$—, and $f(0) = 8$. 
13. (10 points) Let \( g(x) = \int_{4}^{x} e^{t}(t - 13) \, dt \). Determine the \( x \)-value for each inflection point of \( g(x) \).