1. (2 points) Fill in the missing information for the following two theorems.

**Mean Value Theorem** Let $f$ be a function that satisfies the following two hypotheses.

(1) $f$ is ______________ on the closed interval $[a, b]$.

(2) $f$ is ______________ on the open interval $(a, b)$.

Then there is a number $c$ in $(a, b)$ such that ________________________.

**Rolle’s Theorem** Let $f$ be a function that satisfies the following three hypotheses.

(1) $f$ is ______________ on the closed interval $[a, b]$.

(2) $f$ is ______________ on the open interval $(a, b)$.

(3) ________________________.

Then there is a number $c$ in $(a, b)$ such that ________________________.
2. (4 points) Find the $x$-coordinate for the highest point on the graph of the given function.

$$f(x) = \frac{e^x}{e^{6x} + 10}$$
3. (2 points) Find the $x$-coordinate for each inflection point on the graph of the given function.

$$f(x) = 3x^5 - 20x^4 + 40x^3 - 30x + 50$$
4. (2 points) A function \( f(x) \) is differentiable on the interval \((−\infty, \infty)\) and has the following first derivative.

\[
f'(x) = 3e^{4x}(x^2 - 1)^7(3x^2 + 10)^4(5x - 20)^{10}
\]

(a) Find each critical number of the function \( f(x) \).

(b) State each interval upon which the function \( f(x) \) is increasing.

(c) State each interval upon which the function \( f(x) \) is decreasing.

(d) Find the \( x \)-value for each local maximum value of \( f(x) \).

(e) Find the \( x \)-value for each local minimum value of \( f(x) \).