Name: _____

VIP ID: _____

- Write your name and your VIP ID in the space provided above.
- The test has five (5) pages, including this one.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, or notes may be used on this test.
- An approved calculator may be used on this test.

Page	**Max. points**	**Your points**
2	25	
3	25	
4	25	
5	25	
Total	100	

Problem 1 (15 pts)**.** The function $f(x) = x^4 - 5x^3 + 11x$ has a critical point at $x = 1$. Identify what kind of critical point it is.

- ○ $f(x)$ has a local minimum at $x = 1$.
- ○ $f(x)$ has a local maximum at $x = 1$.
- ○ $x = 1$ is neither maximum, minimum, nor inflection point of $f(x)$.
- ○ $f(x)$ has an inflection point at $x = 1$.

Problem 2 (10 pts)**.** The function $y = f(x)$ is shown below. How many inflection points does this function have on the interval shown?

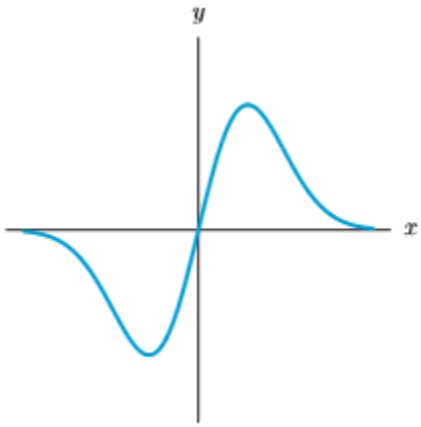

Figure 4.5

- ○ 0
- ○ 1
- ○ 2
- ○ 3

Problem 3 (10 pts)**.** Concerning the graph of the function below, which of the following statements is true?

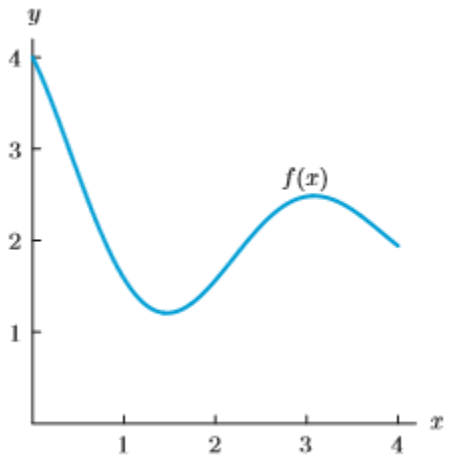

Figure 4.1

- ○ The derivative is zero only at one value of x, where it is a local minimum.
- ○ The derivative is zero at two values of x, both being local maxima.
- ○ The derivative is zero at two values of x, one is a local maximum, while the other is a local minimum.
- ○ The derivative is zero at two values of x, one is a local maximum on the interval, while the other is neither a local maximum nor a minimum.
- ○ The derivative is zero at two values of x, one is a local minimum on the interval, while the other is neither a local maximum nor a minimum.

Problem 4 (15 pts)**.** Find all local maxima, minima and inflection points of the function $f(x) = 2x^3 + 3x^2 - 180x + 9$.

Problem 5 (10 pts)**.** If the graph below is that of $f'(x)$, which of the following statements is true concerning the function $f(x)$?

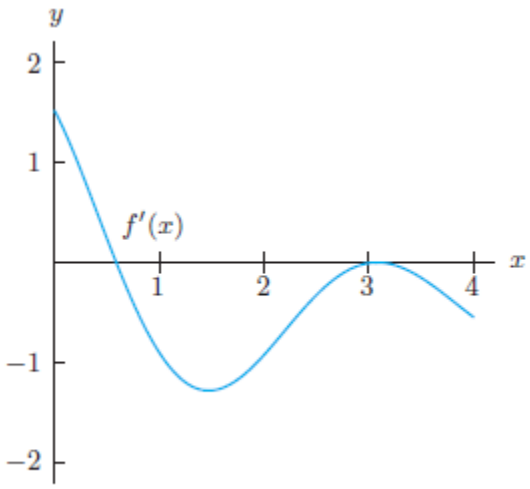

Figure 4.2

- ○ The derivative is zero only at one value of x, where it is a local minimum.
- ○ The derivative is zero at two values of x, both being local maxima.
- ○ The derivative is zero at two values of x, one is a local maximum, while the other is a local minimum.
- ○ The derivative is zero at two values of x, one is a local maximum on the interval, while the other is neither a local maximum nor a minimum.
- ○ The derivative is zero at two values of x, one is a local minimum on the interval, while the other is neither a local maximum nor a minimum.

Problem 6 (15 pts)**.** Find the global maximum and the global minimum of the function $f(x) = 2x^3 - 9x^2$ over the interval $-1 \leq x \leq 6$.

Problem 7 (10 pts)**.** Find the value of constants a and b so that the minimum of the parabola $f(x) = ax^2 - bx + 3$ is at $(1, -1)$.

Problem 8 (15 pts)**.** A cruise line offers a trip for \$1800 per passenger. If at least 100 passengers sign up, the price is reduced for all the passengers by 10 for every additional passenger (beyond 100) who goes on the trip. The boat can accommodate 250 passengers. What number of passengers maximizes the cruise line's total revenue?