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	20	
3	20	
4	40	
5	20	
Total	100	

Problem 1 (10 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 maximum at $x = 1$.

○ $f(x)$ has a local minimum at $x = 1$.

○ $x = 1$ is neither maximum nor minimum of $f(x)$.

Problem 2 (10 pts). Find intervals of increase/decrease and concavity of the function

$$f(x) = 2x^3 + 3x^2 - 180x + 9.$$

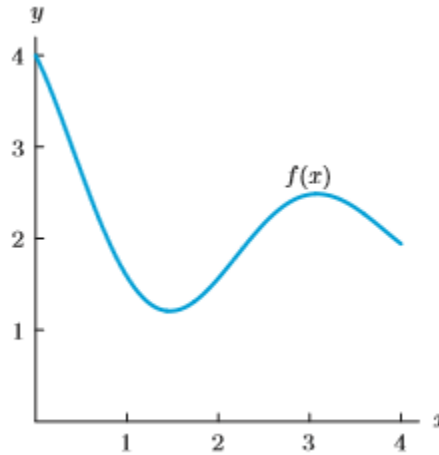**Problem 3** (10 pts). Concerning the graph of the function below, which of the following statements is true?

Figure 4.1

○ The derivative is zero 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.

○ The derivative is zero only at one value of x, where it is a local minimum.

Problem 4 (10 pts). Find the absolute maximum and the absolute minimum values of the function $f(x) = 2x^3 - 9x^2$ over the interval $-1 \leq x \leq 6$.

Problem 5 (10 pts). Suppose $P(t)$ is the number of individuals infected by a disease t days after it was first detected. Interpret $P'(50) = 200$.

Problem 6 (10 pts). A baseball team plays in a stadium that holds 50,000 spectators. With the ticket price at \$8 the average attendance has been 19,000. When the price dropped to \$4, the average attendance rose to 25,000. Find a linear demand function $D(q)$, where q is the number of spectators.

Problem 7 (10 pts). The total cost of producing q units of good is given by $C(q) = 7.3q + 56000$.

(a) What is the total cost of producing 4200 units?

(b) What is the cost of the 4201st item?

Problem 8 (10 pts). The cost function of a product (in dollars) is given by $C(q) = 23.56 + 0.04q$, where q is the number of units sold. What is the average cost of selling 200 units?

Problem 9 (10 pts). A manufacturer has been selling 1300 flat screen TVs a week at $3600 each. A market survey indicates that for each $100 rebate offered to a buyer, the number of TVs sold increase by 100 per week. The weekly cost function is given by $C(q) = 780000 + 1200q$. What should be the rebate offered in order to maximize profit?

Problem 10 (10 pts). At a price of $30 per ticket, a musical theater group can fill every seat in the theater, which has a capacity of 2800. For every $2.5 decrease in price, the number of people buying tickets increases by 175. What ticket price maximizes revenue?