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	30	
5	30	
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?

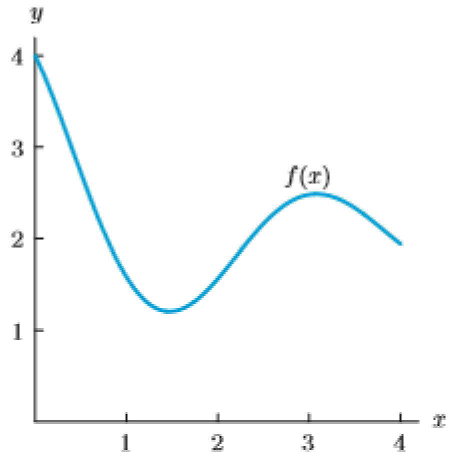

Figure 4.1

- ○ 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?