

Math 102. Practice 1st Midterm

Chapter 3

1 For the function $f(x) = 10x^2 - 7x + 3$ calculate the following values (simplify completely):

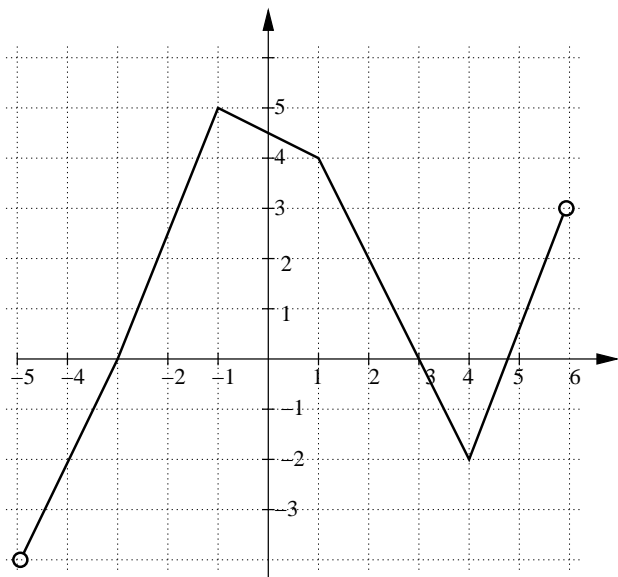
- (i) $f(a)$
- (ii) $f(a + h)$
- (iii) $\frac{f(a + h) - f(a)}{h}$

2 Let $f(x) = \frac{x}{\sqrt{1-x}}$.

- (i) Evaluate $f(3)$, $f(5)$, and $f(a - 1)$.
- (ii) Find the domain of f .

3 Determine the average rate of change of the function $f(x) = x + x^4$ between $x = -1$ and $x = 3$.

4 The function f has the following graph.



- (i) What are the values $f(-2)$, $f(-1)$, and $f(3)$?
- (ii) Determine the domain and the range of f . (Use interval notation.)
- (iii) Determine the intervals on which f is increasing and the intervals on which f is decreasing.
- (iv) Find the local maxima and the local minima of f .

(v) Find the average rate of change of f between 3 and -2 .

5 For the piecewise function f defined by

$$f(x) = \begin{cases} 1 - x^2, & x \leq 2 \\ 2x - 1, & x > 2. \end{cases}$$

- (i) Find the values $f(0)$, $f(-2)$ and $f(2)$.
- (ii) Sketch the graph of f .

6 Use basic shapes and transformations to sketch the graph of $f(x) = 1 - \sqrt{2-x}$

7 For the functions $f(x) = \frac{1}{x+3}$ and $g(x) = \frac{1}{x-2}$, find:

- (i) the functions $f + g$, $f - g$, $f \cdot g$, and f/g ;
- (ii) the domains of the functions in Part (i).

Chapter 4

8 Sketch the graph of $f(x) = -2x^2 + 8x + 3$. Label the vertex and intercepts. What is the maximum value of this function?

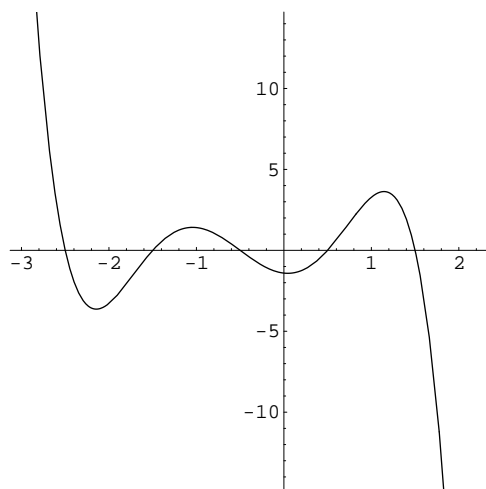
9 Odyssey Travel Agency's monthly profit P (in thousands of dollars) depends on the amount of money x (in thousands of dollars) spent on advertising per month according to the rule $P(x) = -x^2 + 8x + 20$.

(i) What would Odyssey's monthly advertising be in order to maximize its monthly profit?

(ii) What is this maximum monthly profit?

10 A farmer with 2000 meters of fencing wants to enclose a rectangular plot that borders on a straight highway. If the farmer does not fence along the highway, what is the largest area that can be enclosed?

11 The following curve is the graph of a polynomial P .



(i) How many real zeros does P have? Mark them in the graph.

(ii) How many local maxima and how many local minima does P have? Mark them in the graph.

(iii) What is the least possible degree of P ?

(iv) Is the degree of P even or odd?

(v) Is the sign of the leading coefficient of P positive or negative?

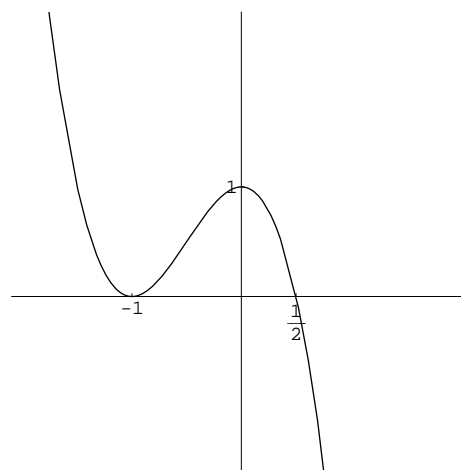
12 For the polynomial $P(x) = x(x + 1)^2(x + 3)$

(i) Find x and y -intercepts.

(ii) Determine its end behavior.

(iii) Sketch its graph. (Make sure that your graph shows all intercepts and exhibits the proper end behavior.)

13 The following curve is the graph of a polynomial of degree 3. Find the polynomial.



14 Find the intercepts and asymptotes of the rational function $r(x) = \frac{1 - 2x}{2x + 3}$, and then sketch its graph.

15 For the rational function $R(x) = \frac{x + 1}{x^2 + 2x - 3}$, find the horizontal and vertical asymptotes, then sketch its graph.