MA 180 Properties of Functions
Section 2.3

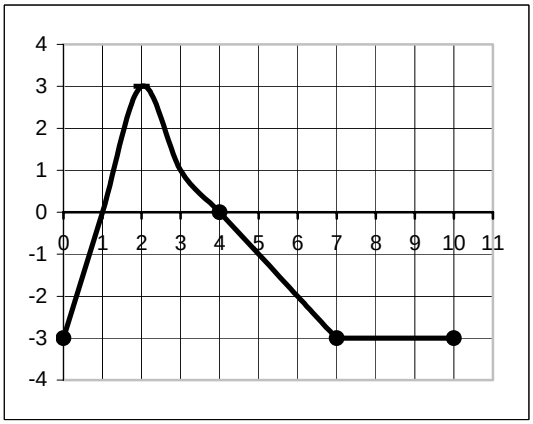
## I. Increasing and Decreasing Functions

- A function f is **increasing** on an open interval I if, for any choice of $x_1$ and $x_2$ in I, with $x_1 < x_2$, we have $f(x_1) < f(x_{2)})$

- A function f is **decreasing** on an open interval I if, for any choice of $x_1$ and $x_2$ in I, with $x_1 < x_2$, we have $f(x_1) > f(x_{2)})$

- A function f is **constant** on an open interval I if, for all choices of x, the values f(x) are equal.

1. The complete graph of a function f is shown. List the interval or intervals on which f is




increasing

decreasing

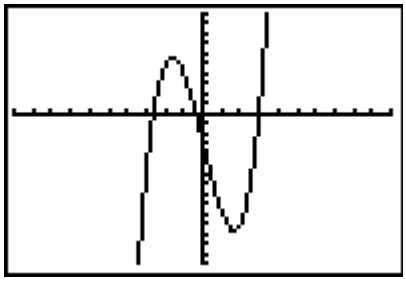
constant

## II. Local Maximum and Local Minimum

- A function f has a local maximum at x = c if there is an open interval containing c so that, for all x in I, $f(x) < f(c)$. We call $f(c)$ a local maximum of f.

- A function f has a local minimum at x = c if there is an open interval containing c so that, for all x in I, $f(x) > f(c)$. We call $f(c)$ a local minimum of f.

2. Use a graphing calculator to graph the function $f(x) = x^3 - 8x - 3$. It should look like the graph shown to the right.



(a) Determine where f has a local maximum and/or local minimum. Write answers rounded to the nearest hundredth.

(b) Determine where f is increasing/decreasing.

**OVER**

III. **Even and Odd Functions**

- A function is **even** if for every number x in its domain, the number -x is also in its domain and $f(-x) = f(x)$. The graph of every even function is symmetric with respect to the y-axis.

- A function is **odd** if for every number x in its domain, the number -x is also in its domain and $f(-x) = -f(x)$. The graph of every odd function is symmetric with respect to the origin.

3. For each of the following functions, use the definitions of even and odd functions to determine if the function is even, odd or neither and then graph the function with your calculator to verify your answer.

(a) $f(x) = 4x^3 + 3x$ (b) $f(x) = 2x^3 + 3x^2$

(c) $f(x) = 3x^2 - 6$

**HW for Section 2.3:**

- 2.3 Concepts and Vocabulary (p. 121)/ # 1- 7 (all)
- 2.3 Exercises (p. 122)/ # 1- 10 (all), 11 - 17 odd, 23, 29, 31, 51, 55, 59, 61, 65, 67, 69