Mini-Lecture 3.1
Linear Functions and Their Properties

Learning Objectives:
1. Graph linear functions
2. Use average rate of change to identify linear functions
3. Determine whether a linear function is increasing, decreasing, or constant
4. Build linear models from verbal description

Examples:
1. For each function, (i) determine the slope and y-intercept; (ii) graph the function using slope and y-intercept; (iii) determine the average rate of change; and (iv) determine whether the function is increasing, decreasing, or constant.

$$(a)\ f(x) = 3x + 5. \qquad (b)\ f(x) = -4x + 2. \qquad (c)\ f(x) = 5.$$

2. Suppose $f(x) = 3x + 6$ and $g(x) = -x + 4$.

    (a) Solve $f(x) = 0$.   (b) Solve $f(x) \geq 0$.

    (c) Solve $f(x) = g(x)$.   (d) Solve $f(x) \leq g(x)$.

3. The cost, C, in dollars of a cellular phone plan is given by the function $C(x) = 0.30x + 7$, where x is the number of minutes used.

    (a) What is the cost of the plan if you talk for 150 minutes?

    (b) If the bill is \$220, how many minutes were used?

    (c) What is the maximum number of minutes that can be used for \$120?

Teaching Notes:
- The delta notation may take them a bit to understand.
- The applications are not difficult and should be interesting. Emphasize these.

Answers: (Graphs are below.)
1. (a) (i) Slope = 3, y-intercept = 5; (iii) 3; (iv) increasing.
   (b) (i) Slope = -4, y-intercept = 2; (iii) -4; (iv) decreasing.
   (c) (i) Slope = 0, y-intercept = 5; (iii) 0; (iv) constant.

2. $(a)\ x = -2 \quad (b)(-2, \infty) \quad (c)\ x = -\dfrac{1}{2} \quad (d)\left(-\infty, -\dfrac{1}{2}\right]$

3. (a) \$52   (b) 710   (c) 376

1.

| (a) | (b) | (c) |