

College Algebra Day 3

Sections 2.1 and 2.2

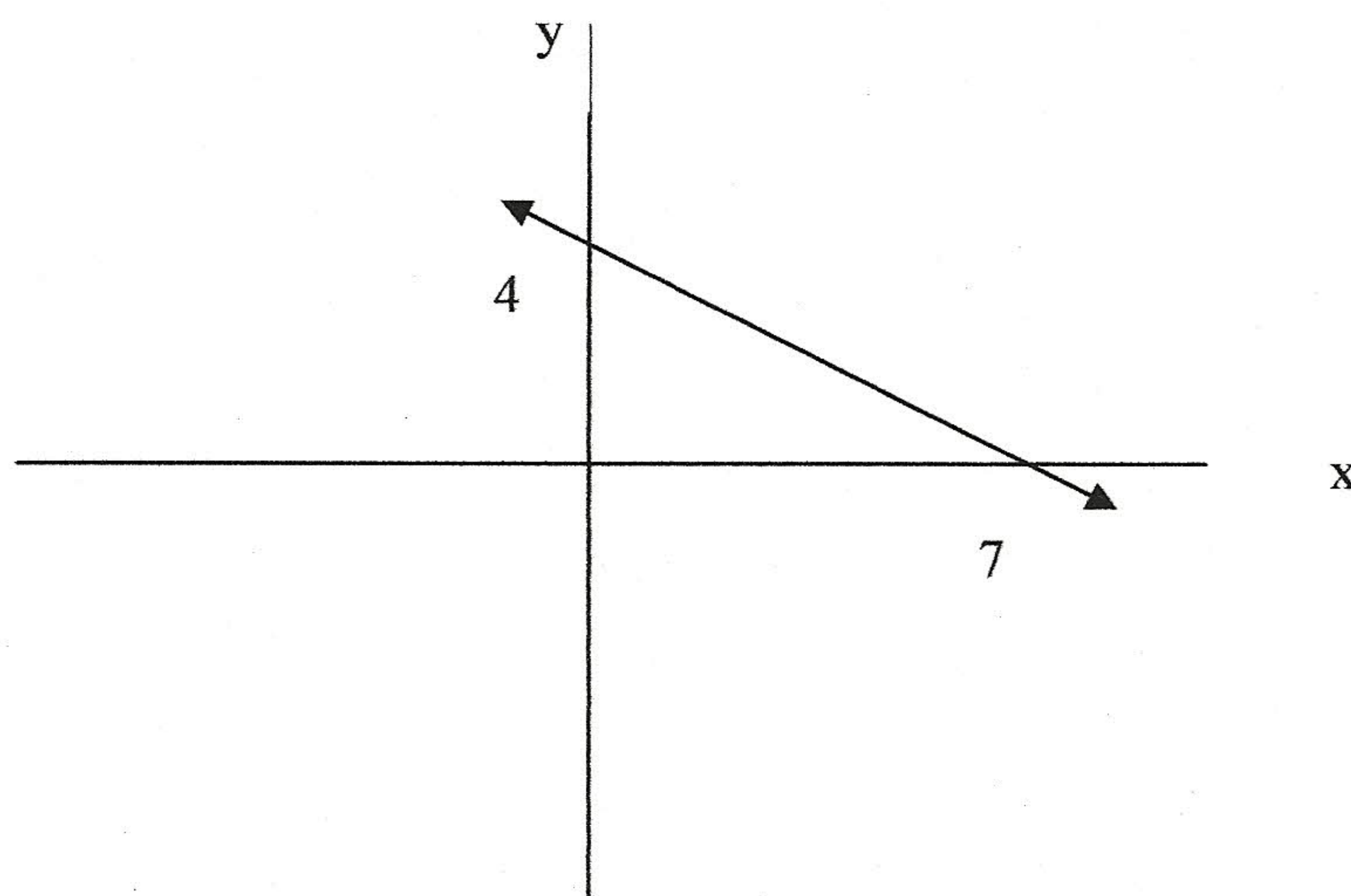
Linear Functions:

Recall from yesterday, a linear function has form $f(x) = ax + b$, where a and b are real numbers.

Finding a formula from a graph

Example: Use the graph below to answer the following:

- (a) Find the slope and intercepts.
- (b) Write a linear function for the graph
- (c) Find any zeros



Modeling with Linear Functions

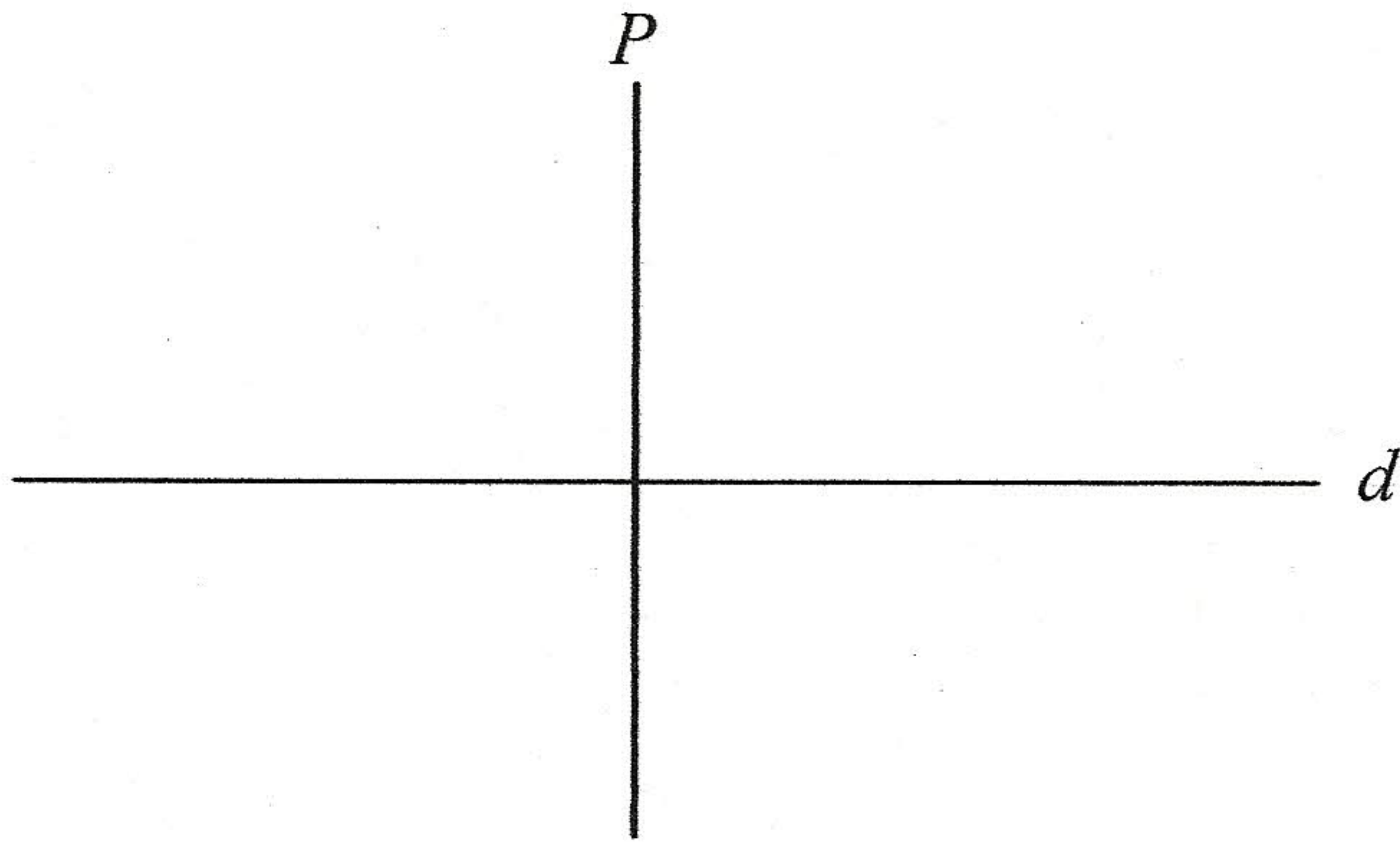
$$f(x) = (\text{constant rate of change}) \cdot x + (\text{initial amount})$$

Example: Function Workout #6

Example: An ecologist investigating the effect of air pollution on plant life finds the percentage, P , of diseased trees and shrubs at a distance of d kilometers from an industrial city. She notes that at a distance of 100 kilometers, 24 percent of the trees and shrubs are diseased and at a distance of 200 kilometers, 18 percent of the trees and shrubs are diseased.

- (a) Find a linear function that expresses the percentage, P , of diseased trees and shrubs in terms of the distance d in kilometers from an industrial city.

(b) Sketch a graph of P in terms of d for $0 \leq d \leq 200$.



(c) At approximately what distance from the city are 20 percent of the trees and shrubs diseased?

Piecewise Defined Functions and the Greatest Integer Function

Used whenever a single simple function cannot accurately describe the given data

Examples are the cost of a cab ride, the cost for electricity, phone charges, filling, then emptying a storage tank, and many more.

Example: Suppose you decide to go for some exercise and you leave your home and begin jogging at a constant rate of 6 mph for 0.5 hours, followed by walking at a constant rate of 4 mph for 1 hour, then rest for 0.5 hours before walking back home at a constant rate of 2 mph. Sketch a piecewise linear function that models the distance you are from your house at time t in hours. Where is your function increasing, decreasing, or constant?

Example: Suppose $f(x) = \begin{cases} -3 & \text{if } x \leq -1 \\ 2x & \text{if } -1 < x < 1 \\ 1-x & \text{if } x > 1 \end{cases}$

Find the following:

- (a) What is the domain of f ?
- (b) Sketch a graph of f .
- (c) Evaluate $f(-2)$, $f(0)$, $f(1)$, and $f(3)$
- (d) Is f continuous on its domain?

The Greatest Integer Function

Example: Longhorn Rentals charges \$49 per day plus \$0.40 per mile to rent one of their cargo vans. Fractions of miles are ignored. Find a function that calculates the cost of driving x miles in one day.

Linear Regression: Use the Linear Modeling Handout to demonstrate a scatter plot

Section 2.2 Equations of Lines, Direct Variation

Point Slope Form

Example: Find an equation of the line passing through the points $(-2, 5)$ and $(3, -4)$.

Slope-Intercept Form

Example: Find an equation of the line having slope $\frac{1}{3}$ and passing through the point $(3, 1)$.

Finding intercepts

From the standard form:

Intercept Form of a Line

Horizontal, Vertical, Parallel, and Perpendicular Lines

Equations and Slopes

Examples: Write an equation for the line satisfying the following conditions:

- (a) vertical and passing through $(2, -1)$.
- (b) Parallel to the line $3x - y = 4$ and passing through $(0, 4)$.
- (c) Perpendicular to the line $-x + 5y = 12$ and passing through $(-4, -3)$.
- (d) Coincides with the x -axis.
- (e) Coincides with the y -axis.

Applications:

Direct Variation:

Definition:

Example: The cost of tuition is directly proportional to the number of credits taken. If 11 credits cost \$720.50, find the cost of taking 16 credits.

Example: Hooke's Law p 112 #113

Example: Students try the linear modeling handout example CO_2 emissions.