

MAC2233 Test Review 1

Distance Formula and Equations of Circles

- 1.) If the distance between $(x,3)$ and $(4,1)$ is 5, what is the value of x ?
- 2.) A circle centered at $(1,3)$ contains the point $(3,3)$. For such a circle, what is its radius, r ?

Straight Lines and Slopes

- 1.) Graph the following equations:
- a.) $y = 4x - 4$
- b.) $2x + 3y = -3$
- 2.) Find an equation of the line that passes through the point $(2,4)$ and is perpendicular to the line $3x + 4y - 22 = 0$.
- 3.) Given that the point $P(-3,5)$ lies on the line $kx + 3y + 9 = 0$, find k .

Functions and Graphs

- 1.) For the function described by $f(x) = \sqrt{x-2}$, find:

$$\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

- 2.) Determine if the following are functions, and if so, what is the domain of each?
- (a.) $x^2 + y^2 = 4$

$$(b.) s(t) = \frac{2t}{t^2 - 1}$$

$$(c.) f(x) = \sqrt{4 - x^2}$$

3.) Sketch the graph of $y = x^2 - 4x - 12$, and label the vertex and intercepts.

4.) Write the equation of a parabola that has been shifted left one unit, up 4 units, then shifted across the x-axis.

5.) A study prepared for a Sunbelt town's Chamber of Commerce projected that the population of the town in the next 3 yr will grow according to the rule

$$P(x) = 50,000 + 30x^{\frac{3}{2}} + 20x$$

where $P(x)$ denotes the population x mo from now. By how much will the population increase during the next 9 mo? During the next 16 mo?

The Algebra of Functions

1.) For the following pair of functions, $f(x) = \sqrt{1 - 4x}$ and

$$g(x) = \frac{1}{x^2}, \text{ find the following:}$$

(a.) fg **(b.)** $(f \circ g)(x)$ **(c.)** $(g \circ f)(x)$ and its domain

2.) A division of Chapman Corporation manufactures a pager. The weekly fixed cost for the division is \$20,000, and the variable cost for producing x pagers/week is

$$V(x) = 0.000001x^3 - 0.01x^2 + 50x$$

dollars. The company realizes a revenue of

$$R(x) = -0.02x^2 + 150x$$

dollars from the sale of x pagers/week.

- (a.) Find the total cost function
- (b.) Find the total profit function
- (c.) What is the profit for the company if 2000 units are produced and sold each week?

Functions and Mathematical Models

- 1.) A manufacturer has a monthly fixed cost of \$100,000 and a production cost of \$14 for each unit produced. The product sells for \$20/unit.
- (a.) What is the cost function?
 - (b.) What is the revenue function?
 - (c.) What is the profit function?
 - (d.) Compute the profit corresponding to production levels of 12,000 and 20,000 units.
- 2.) When a new CD is marketed at FYE, market figures show that an average of 250 will sell when the price is \$15, and an average of 300 will sell when the price is reduced by \$1. Assuming the demand function is linear,
- (a.) Find P as a function of x .
 - (b.) Assuming the supply function is $s(x) = 0.02x + 8$, find the equilibrium quantity and price.
 - (c.) Find the demand function $x(p)$, and the corresponding revenue function. What does the slope of this demand function represent?

- 3.) Assume that the demand function for a certain commodity has the form

$$p = \sqrt{-ax^2 + b} \quad (a \geq 0, b \geq 0)$$

where x is the quantity demanded, measured in units of a thousand and P is the unit price in dollars. Suppose the quantity demanded is 6000

($x = 6$) when the unit price is \$8.00 and 8000 ($x = 8$) when the unit price is \$6.00.

a) Determine the demand equation.

b) What is the quantity demanded when the unit price is set at \$7.50?

Limits and Continuity

1.) Evaluate the following limits, if they exist:

(a.) $\lim_{x \rightarrow 4} \frac{x - 4}{\sqrt{x} - 2}$

(b.) $\lim_{x \rightarrow \infty} \frac{-4x^5 - 3x^2 + 1}{2x^4 + x^3 + x^2 + x + 1}$

(c.) Given $f(x) = \begin{cases} px^2 + 1 \dots x < -1 \\ x - 2 \dots x = -1 \\ 2 + qx \dots x > -1 \end{cases}$ Find p and q to make

$f(x)$ continuous at $x = -1$.

2.) Let $f(x) = \frac{x^3 + x^2}{|x + 1|}$. Find:

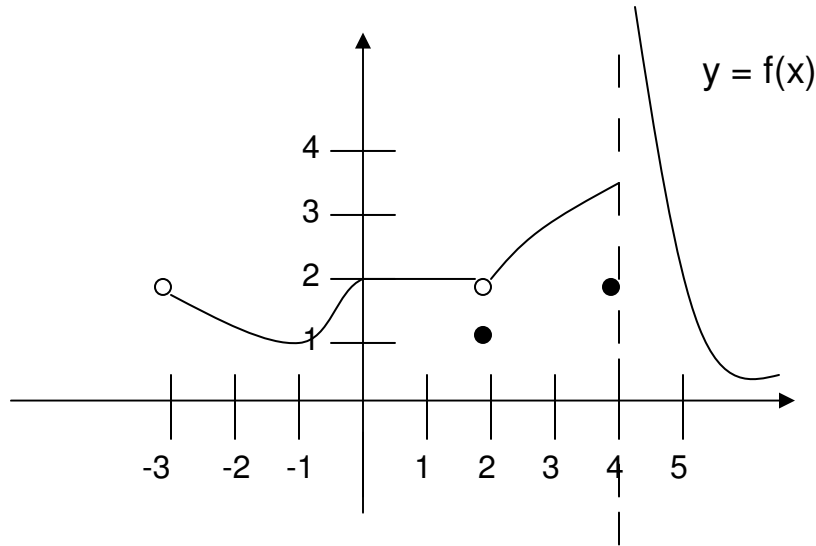
(a.) Write the function in a piecewise fashion.

(b.) $\lim_{x \rightarrow -1^-} f(x)$

(c.) $\lim_{x \rightarrow -1^+} f(x)$

(d.) $\lim_{x \rightarrow 1} f(x)$

3.) Refer to the graph drawn below and determine whether each statement is true or false, and discuss the continuity of $f(x)$.



(a.) $\lim_{x \rightarrow -3^+} f(x) = 2$

(b.) $\lim_{x \rightarrow 0} f(x) = 2$

(c.) $\lim_{x \rightarrow 2} f(x) = 1$

(d.) $\lim_{x \rightarrow 4^-} f(x) = 3$

(e.) $\lim_{x \rightarrow 4^+} f(x)$ does not exist

(f.) $\lim_{x \rightarrow 4} f(x) = 2$