Practice Test | 1st Exam on Tuesday Sept. 23,1997 | Today's Date: Sept. 18,1997
Chapter 1 (everything) | Time: 9:00-10:15 am during regular class hour

Business Calculus (Mathematics 223 – Fall 1997)

Exercise #1: Given $f(x) = \dfrac{1}{\sqrt{x+3}} + x + 2$: (a) Find the domain of $f(x)$.
(b) Find $h(x)$ and $g(u)$ such that $f(x) = g(h(x))$.

Problem #2: Given $f(x) = \dfrac{x}{x-2} + 1$: (a) Find x and y intercepts, if any.
(b) Point out the x value(s) at which $f(x)$ is discontinuous.

Exercise #3: Find the equation of the line passing (1,2) and perpendicular to $2x = 3x + 1$.

Exercise #4: A manufacturer buys \$20,000 worth of machinery that depriciates at a constant rate so that its value after 10 years will be \$12,000. (a) Express the value of the machinery as a function of its age.
(b) Compute the value of the machinery at the end of the 4th year.

Exercise #5: A closed box with a square base has a surface area of 4,000 square centimeters. Express its volume as a function of the length of its base.

Problem #6: A manufacturer can sell its product for \$90 apiece. Its total cost consists of a fixed cost of \$8,000 and production cost of \$50 apiece. How many products must the manufacturer sell to make a profit of \$200?

Exercise #7: Find the following limits: (a) $\displaystyle\lim_{x\longrightarrow 9} \frac{\sqrt{x}-3}{x-4}$ (a) $\displaystyle\lim_{x\longrightarrow 0} \frac{x^2-x}{x}$.

Problem #8: $f(x) = \begin{cases} x+9 & x < 2 \\ x^2+4A-1 & x \geq 2 \end{cases}$
Find the value of A so that $f(x)$ is continuous at $x = 2$.

Problem #9: Find the following limits: (a) $\displaystyle\lim_{x\longrightarrow \infty} \frac{3x^2-6x+2}{2x^2-9}$ (b) $\displaystyle\lim_{x\longrightarrow 0^-} \left(1+\frac{x+2}{x}\right)$.

Problem #10: The graph of $y = f(x)$ is as shown, find the following:

(a) All x values at which the limit of $f(x)$ does not exist.

(b) All x values at which $f(x)$ is not continuous.

(c) All vertical and horizontal asymptotes, if any.

Problem #11: Let $f(x) = x^2 - 6x + 9$ and $g(x) = 2x - 3$. Find $f(g(x))$ and $g(g(x))$. Simplify your answer as much as possible.

Problem #12: Find the equation of the line passing through the point $(-2,3)$ and parallel to the line $6x - 3y = 5$. Write the equation in slope-intercept form.

Exercise #13: Compute the following limits (if they exist):

(a) $\lim_{x \longrightarrow 3} \dfrac{x^2+5x+6}{x^2-4}$ (b) $\lim_{x \longrightarrow 2} \dfrac{x^2+5x+6}{x^2-4}$

(c) $\lim_{x \longrightarrow -2} \dfrac{x^2+5x+6}{x^2-4}$ (d) $\lim_{x \longrightarrow +\infty} \dfrac{x^2+5x+6}{x^2-4}$.

Exercise #14: What is the domain of the function $f(x) = \dfrac{\sqrt{2x-6}}{x^2-16}$?

Exercise #15: Consider the function f with the following graph:

True or False:

(a) f is defined at $x = 5$ T F

(b) $\lim_{x \longrightarrow 5} f(x)$ exists T F

(c) $\lim_{x \longrightarrow -3} f(x)$ exists T F

(d) f is continuous at $x = -3$ T F

Exercise #16: Let $f(x) = \begin{cases} x^2 - 4x + 4 & \text{if } x < 3 \\ 13 & \text{if } x = 3 \\ 2x - 5 & \text{if } x \geq 3 \end{cases}$

(a) Compute $\lim_{x \longrightarrow 3^-} f(x)$.

(b) Compute $\lim_{x \longrightarrow 3^+} f(x)$.

(c) Does $\lim_{x \longrightarrow 3} f(x)$ exist? If so, what is its value? If not, explain why not.

(c) Is f continuous at $x = 3$? Why or why not?

Exercise #17: An open box with a square base is to be constructed for \$72. The sides of the box cost \$4 per square meter. The base costs \$7 per square meter. Express the volume of the box as a function of the length of its base.

Exercise #18: A bookstore can obtain a certain gift book from the publisher at a cost of \$3 per book. The bookstore has been offering the book at the price of \$15 per copy and, at this price, has been selling 200 copies a month. The bookstore estimates that for each \$1 reduction in the price, 20 more books will be sold each month.

(a) Express the number N of books sold per month as a function of the selling price x.

(b) Express the montly profit P as a function of the selling price x.

(c) Sketch the graph of $P(x)$. Be sure to label all intercepts and *important points*.

(d) What is the optimal selling price?