Differential Calculus – Mth 251

Archive – Fall 2000 Files

Jan 31, 2001

This archive contains the sample problems and tests from Mth 251 Fall 2000. The original test instructions, headers and formatting have not been preserved.

Contents

1 Sample Problems Set 1

The problems below are in random order, or at any rate in the order they occured to me. On a test they would all be cast as *multiple choice* problems. Two of the problems below have been written as multiple choice problems so you can see the format that I use.

Problem 1. Find the limit

$$\lim_{x\to 1} \frac{x^3 + x^2 - 17x + 15}{x^3 + x^2 - 10x + 8}.$$

Problem 2. Find the limits

$$\lim_{x\to\infty} \frac{\sqrt{9x^2+2}}{3x-5}, \quad \text{and} \quad \lim_{x\to-\infty} \frac{\sqrt{9x^2+2}}{3x-5}.$$

Problem 3. Find the limit

$$\lim_{x\to\infty} \left(\sqrt{x^2+13x} - x\right).$$

Problem 4. You travel a certain distance d at 30 mph, then twice as far at 45 mph and then a distance $3d$ at 65 mph. Which of the following speeds is closest to your average speed for the whole distance?

A.) 46.7 mph

B.) 48.2 mph

C.) 48.4 mph

D.) 50.0 mph

E.) 52.5 mph

☐ ←*Write letter corresponding to your answer here and mark it on the scantron (Problem 4).*

Problem 5. One can show

$$\log(x) \le 4\left(x^{1/4} - 1\right) \quad \text{for all } x > 0.$$

Use this fact and the squeeze law to compute

$$\lim_{x\to\infty} x^{-1/2}\log(x).$$

Note I use $\log(x)$ to denote the *natural* logarithm of x.

Problem 6. Find the limit

$$\lim_{x\to-2} \frac{x^4+3x^3-2x^2-12x-8}{x^4+x^3-6x^2-4x+8}.$$

Problem 7. Given

$$\lim_{x\to0} \frac{\sin(x)-x}{x^3} = -\frac{1}{6} \quad \text{and} \quad \lim_{x\to0} \frac{1-\cos(x)}{x^2} = \frac{1}{2}$$

compute

$$\lim_{x\to0} \frac{\tan(x)-x}{x^3}.$$

Problem 8. If

$$f(x) = 3x^2 - 2x + 5 \quad \text{and} \quad g(x) = x^2 + 2$$

then the composition $h = f \circ g$ is given by

A.) $h(x) = x^4 + 4x^2 + 6$

B.) $h(x) = 3x^4 - 2x^3 + 11x^2 - 4x + 10$

C.) $h(x) = 3x^4 + 10x^2 + 13$

D.) $h(x) = 9x^4 - 12x^3 + 34x^2 - 20x + 27$

E.) None of the above.

☐ ←*Write letter corresponding to your answer here and mark it on the scantron (Problem 8).*

Problem 9. Let

$$p(x) = x^3 - 2x^2 + 3x.$$

Find $a \neq 0$ such that the tangent line to the graph of $p(x)$ at the point $(a, p(a))$ passes through the origin.

Problem 10. Assume the distance a certain body falls in t seconds is given by

$$s = 16t^2 - 6t \quad \text{ft.}$$

Find the downward speed at which the body is falling at the moment that it has fallen 1 foot.

2 Sample Problems Set 2

Problem 11. The function f defined by

$$f(x) = \begin{cases} \sin(x) & \text{if } x \neq 0 \\ 0 & if x = 0 \end{cases}$$

A.) is even but not odd

B.) is odd but not even

C.) is neither even nor odd

D.) is both even and odd

E.) None of the above.

☐ ←*Write letter corresponding to your answer here and mark it on the scantron (Problem 11).*

Problem 12. The function h defined by

$$h(x) = \begin{cases} \frac{1-\cos(x)}{x^2} & \text{if } x \neq 0 \\ \frac{1}{2} & \text{if } x = 0 \end{cases}$$

A.) is even but not odd

B.) is odd but not even

C.) is neither even nor odd

D.) is both even and odd

E.) None of the above.

☐ ← *Write letter corresponding to your answer here and mark it on the scantron (Problem 12).*

Problem 13. The function g defined by

$$g(x) = x + |\,x\,|$$

A.) is even but not odd
B.) is odd but not even
C.) is neither even nor odd
D.) is both even and odd
E.) None of the above.

☐ ← *Write letter corresponding to your answer here and mark it on the scantron (Problem 13).*

Problem 14. The function g defined by

$$g(x) = 0 \quad \text{for all } x$$

A.) is even but not odd
B.) is odd but not even
C.) is neither even nor odd
D.) is both even and odd
E.) None of the above.

☐ ← *Write letter corresponding to your answer here and mark it on the scantron (Problem 14).*

Problem 15. Suppose we know a certain function f is given by

$$f(x) = Cx^a$$

where $C > 0$ and $a > 0$ are constants. Suppose we observe

$$f(2.1) = 6.0672 \quad \text{and} \quad f(3.2) = 10.2719.$$

From the following list chose the number closest to $f(3.7)$.

A.) 12.2531
B.) 12.3158
C.) 12.4679
D.) 12.9783
E.) 16.7231

☐ ←*Write letter corresponding to your answer here and mark it on the scantron (Problem 15).*

Problem 16. The relationship between the Fahrenheit, F, and Celsius, C, temperature scales is given by

$$F = \frac{9}{5}C + 32.$$

Find the temperature which has the same numerical value in either scale.

Problem 17. Consider a tank with circular symmetry about a vertical axis. If the tank is full of water and the water drains out through a small hole in the bottom, then according to Toricelli

$$A(h)R = a\sqrt{2gh}$$

where h is the head (the height of the water surface above the hole), g is the acceleration of gravity, $-R$ is the (instantaneous) rate of change, with respect to time t, of the height of the water, and $A(h)$ is the area of a horizontal cross-section of the tank at height h. If r is the radius of the tank at height h find a formula for r in terms of h such that R is constant. When you are done you will have designed a *clepsydra*, that is, a water clock.

If we think of the y–axis as the axis of symmetry of the tank, choose the x–axis at the bottom of the tank in any direction perpendicular to the y–axis, then the surface of the tank meets the xy–plane in a curve. Find an equation for this curve.

Problem 18. Find the (smallest positive) period of the period function

$$p(x) = |\sin(x)|.$$

Problem 19. Given

$$\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x = e = 2.7182818284590452353602874713526624\cdots$$

compute

$$\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^{2x}, \qquad \lim_{x\to\infty}\left(1+\frac{2}{x}\right)^{x} \quad \text{and} \quad \lim_{x\to\infty}\left(1+\frac{2}{x}\right)^{2}$$

Problem 20. Given

$$\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x = e = 2.7182818284590452353602874713526624\cdots$$

compute

$$\lim_{x\to\infty}\left(1-\frac{1}{x}\right)^{2x}, \qquad \lim_{x\to\infty}\left(1-\frac{2}{x}\right)^{x} \quad \text{and} \quad \lim_{x\to\infty}\left(1-\frac{2}{x}\right)^{2}$$

Problem 21. Let f be a differentiable function. Find an equation which must be satisfied by a if the tangent line to the graph of f at a passes through the origin. For the parabola $y = x^2 - 8x + 9$ find the 2 points on the parabola such that the tangent lines at these points pass through the origin.

Problem 22. If

$$p(x) = x^3 - 3x^2 - 9x + 7$$

find the points where the tangent to the graph of p is horizontal.

Problem 23. Let

$$f(x) = \begin{cases} x^2 \sin(\frac{1}{x}) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases} .$$

Find the derivative $f'(0)$, if it exists.

Problem 24. Find the derivative of

$$g(x) = \frac{x^3 - 6x^2 + 2x - 7}{x\sqrt{x}}.$$

3 Sample Problems Set 3

Problem 25. According to Galileo if a falling body falls from rest h m. in t seconds, then

$$h = \frac{1}{2} g t^2$$

where g is the acceleration of gravity. At sea level we have $g = 9.8$ m/sec^2. (A) How fast is a body falling after it has fallen 10 m? (B) Solve the general problem, that is find a formula for the velocity in terms of the distance fallen.

Problem 26. Let

$$f(x) = ax^2 + bx + c$$

where a, b and c are constants and $a \neq 0$. Find $\gamma > 0$ such that the tangent line at $(\gamma, f(\gamma))$ and the tangent line $(-\gamma, f(-\gamma))$ intersect orthogonally (that is, at a right angle).

Problem 27. Find the derivative of

$$\frac{e^x x^2}{x^3 + 1}.$$

Problem 28. Find the tangent line at $(1, 2)$ to the graph of

$$g(x) = \frac{x + 1}{x^2}.$$

Problem 29. Compute

$$e^x \frac{d}{dx} \left(e^{-x}(x^2 + 1) \right).$$

4 Sample Problems Set 4

Problem 30. Consider the curve

$$x^3 + x^4y^5 - x^2y = 1.$$

If (x, y) is a point on the curve, compute $\dfrac{dy}{dx}$ at (x, y).

Problem 31. Consider the curve

$$x^3 + x^4y^5 - x^2y = 1.$$

If (x, y) is a point on the curve, compute $\dfrac{d^2y}{dx^2}$ at (x, y).

Problem 32. Consider the curve

$$x^3 + x^4y^5 - x^2y = 1.$$

If (x, y) is a point on the curve, compute $\dfrac{d^3y}{dx^3}$ at (x, y).

Problem 33. If $f(x) = x^{2x}$ compute $f'(x)$.

Problem 34. If $f(x) = (2x)^x$ compute $f'(x)$.

Problem 35. If $f(x) = \tan(x^2)$ compute $f'(x)$.

Problem 36. If $f(x) = x \arctan(x)$ compute $f'(x)$.

Problem 37. If $f(x) = x \sin(\log(x))$ compute $f'(x)$.

Problem 38. If $f(4) = 0$ and $f'(4) = -2$ compute $\lim_{x \to 4} \frac{f(x)}{x-4}$.

Problem 39. A ladder of length L is leaning against a vertical wall. If y it the height of the top of the ladder and x is the distance of the foot of the ladder from the wall, and the ladder is sliding, find a relationship between $\dfrac{dx}{dt}$ and $\dfrac{dy}{dt}$ where t is time.

5 Sample Problems Set 5

Problem 40. Find the derivative of $\log |\sec(x) + \tan(x)|$.

Problem 41. Find the derivative of $\sec(x)\tan(x)$.

Problem 42. Find the derivative of $\arctan(x^2)$.

Problem 43. Compute the derivative of $x \log(x)$. Then find a function whose derivative is $\log(x)$.

Problem 44. You travel a certain distance at 70 mph and three times that far at 50 mph. What is your average speed for the whole trip?

Problem 45. We wish to fence in a rectangular plot of area A with a fence running north-south (NS) and east-west (EW). After we fence in the plot we will add an extra two pieces of fencing running NS to divide the plot into three equal pieces. What dimensions should we make our plot to minimize the cost of all the fencing?

Problem 46. Use an initial guess of $x_0 = 1.4$ and several iterations of Newton's method to approximate the smallest positive solution of the equation $\tan(x) = 3x$. What happens if your initial guess is $x_0 = 1.6$? Experiment!

Problem 47. If $g(x) = -2x^3 - 3x^2 + 12x$ if g increasing on $[0, 2]$? On $[0, 1]$? On $[-2, 1]$?

Problem 48. If $g(x) = -2x^3 - 3x^2 + 12x$ find the inflection points of g. Find the largest interval on which g is concave down.

Problem 49. State the second derivative test. What can you say about a critical point a of f where $f''(a) = 0$.

6 Test 1

Problem 50. The function g defined by $g(x) = x^2 - x^3$

A.) is even but not odd **B.)** is odd but not even
C.) is neither even nor odd **D.)** is both even and odd **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 50. Be sure to mark the scantron too.*

Problem 51. Compute the limit $\lim_{x\to\infty} x - \sqrt{x^2 - 3x + 7}$.

A.) 7 **B.)** 7/2
C.) 3 **D.)** 3/2 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 51. Be sure to mark the scantron too.*

Problem 52. If

$$f(x) = x^2 - 2x + 3 \quad \text{and} \quad g(x) = 3x - 2$$

then the composition $h = f \circ g$ is given by

A.) $9x^2 - 18x + 11$ **B.)** $3x^2 - 6x + 7$
C.) $3x^3 - 8x^2 + 13x - 6$ **D.)** $9x^2 - 18x + 3$ **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 52. Be sure to mark the scantron too.*

Problem 53. Compute the limit

$$\lim_{x\to-2} \frac{x^3 + 2x^2 - 7x - 14}{2x^3 + 4x^2 + 3x + 6}.$$

A.) $\dfrac{-7}{3}$ **B.)** $\dfrac{-3}{11}$
C.) 1 **D.)** does not exist **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 53. Be sure to mark the scantron too.*

Problem 54. If $f(x) = \dfrac{e^x}{x^2+1}$ find a such that the tangent to the graph of f at $(a, f(a))$ is horizontal, that is, has slope 0.

A.) -1 **B.)** 0
C.) 1 **D.)** 2 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 54. Be sure to mark the scantron too.*

Problem 55. Let f and g be differentiable functions such that $f(0) = 2$, $f'(0) = -1$, $g(0) = -3$ and $g'(0) = 2$. Let $h(x) = f(x)/g(x)$. Compute $h'(0)$.

A.) $1/9$ **B.)** $-1/9$
C.) $1/4$ **D.)** $-1/4$ **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 55. Be sure to mark the scantron too.*

Problem 56. Let f and g be differentiable functions such that $f(0) = 2$, $f'(0) = -1$, $g(0) = -3$ and $g'(0) = 2$. Let $h(x) = f(x)g(x)$. Compute $h'(0)$.

A.) 1 **B.)** -1
C.) 3 **D.)** 7 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 56. Be sure to mark the scantron too.*

Problem 57. Find the equation of the tangent line to graph of $f(x) = \dfrac{1}{x^2+2x}$ at the point $(1, \frac{1}{3})$.

A.) $9y - 4x + 1 = 0$ **B.)** $9x + 4x - 7 = 0$
C.) $9y + 3x - 6 = 0$ **D.)** $9y - 3x = 0$ **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 57. Be sure to mark the scantron too.*

Problem 58. If

$$f(x) = \begin{cases} x\sin(1/x) \text{ if } x \neq 0 \\ 0 \text{ if } x = 0 \end{cases}$$

then (select the strongest true assertion) f is

A.) differentiable at the origin **B.)** continuous at the origin
C.) not continuous at the origin **D.)** odd **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 58. Be sure to mark the scantron too.*

Problem 59. [Creativity required] Let f be a differentiable function such that $f(0) = 0$, $f(1) = 0$, $f'(0) = 1$ and $f'(1) = -1$. Compute $\lim_{x \to 0} \dfrac{f(x)}{x}$.

A.) 1 **B.)** 0
C.) -1 **D.)** undefined **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 59. Be sure to mark the scantron too.*

7 Test 2

Problem 60. If a particle travels a *distance* s in time t then the *velocity* v is the rate of change of s relative to time. The *acceleration* a is the rate of change of v relative to time. The *jerk* is the rate of change of a relative to time. If $s = 2t^4 + 6t^3 - 4t^2 - 3t + 1$ then find the jerk at time $t = 2$.

A.) 59 **B.)** 132
C.) 160 **D.)** 117 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 60. Be sure to mark the scantron too.*

Problem 61. If $f(x) = \tan(2x - 2)$ compute $f'(1)$.

A.) 0 **B.)** 1
C.) 2 **D.)** 4 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 61. Be sure to mark the scantron too.*

Problem 62. Compute $\lim_{x \to 1} \dfrac{\tan(2x-2)}{x^2 - 1}$.

A.) 0 **B.)** 1
C.) 2 **D.)** 4 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 62. Be sure to mark the scantron too.*

Problem 63. Let f and g be differentiable functions and suppose

$f(0) = 1$	$f(1) = -1$	$f(2) = -1$	$g(0) = 5$	$g(1) = 2$	$g(2) = 1$
$f'(0) = -1$	$f'(1) = 2$	$f'(2) = 3$	$g'(0) = -4$	$g'(1) = -2$	$g'(2) = 0$

Let h be the composition $h = f \circ g$. Find $h'(1)$.

A.) 4 **B.)** 2
C.) 0 **D.)** -6 **E.)** None of the above.
☐ ←*Letter corresponding to your answer to problem 63. Be sure to mark the scantron too.*

Problem 64. If $f(x) = \left(x^4+1\right)^{1024}$, find $\log_2\left(f'(1)\right)$.

A.) 1035 **B.)** 1033
C.) 1025 **D.)** 1022 **E.)** None of the above.
☐ ←*Letter corresponding to your answer to problem 64. Be sure to mark the scantron too.*

Problem 65. Find the slope of the tangent to the curve

$$x\cos(y) + y\sin(x) = \frac{\pi\sqrt{2}}{4}$$

at the point $\left(\frac{\pi}{4}, \frac{\pi}{4}\right)$.

A.) $\frac{4+\pi}{4-\pi}$ **B.)** $\frac{\pi+4}{\pi-4}$
C.) -1 **D.)** 0 **E.)** None of the above.
☐ ←*Letter corresponding to your answer to problem 65. Be sure to mark the scantron too.*

Problem 66. Differentiate implicitly to find $\dfrac{d^2y}{dx^2}$ at the point $(1,1)$ if $x^3 + y^2 = 2$.

A.) $-\frac{3}{4}$ **B.)** $-\frac{3}{2}$
C.) $-\frac{9}{4}$ **D.)** $-\frac{9}{2}$ **E.)** None of the above.
☐ ←*Letter corresponding to your answer to problem 66. Be sure to mark the scantron too.*

Problem 67. If $f(x) = x^{\sqrt{x}}$ find the derivative $f'(4)$.

A.) 8 **B.)** $8(1+\log(2))$
C.) $4(1+\log(4))$ **D.)** 1 **E.)** None of the above.
☐ ←*Letter corresponding to your answer to problem 67. Be sure to mark the scantron too.*

Problem 68. A 5 foot ladder is leaning against a vertical wall and is sliding. At the moment that the bottom of the ladder is 3 feet from the base of the wall the top is observed to be descending at 6 feet per minute. How fast is the bottom sliding out from the wall at this instant?

A.) 8 **B.)** $\frac{9}{2}$
C.) 6 **D.)** -8 **E.)** None of the above.
☐ ←*Letter corresponding to your answer to problem 68. Be sure to mark the scantron too.*

Problem 69. If $f(x) = \log(x^2+1) - 2x\arctan(x)$ then $f'(x) =$

A.) 0 **B.)** $\arctan(x)$
C.) $\frac{2x}{x^2+1} - 2\arctan(x)$ **D.)** $-2\arctan(x)$ **E.)** None of the above.
☐ ←*Letter corresponding to your answer to problem 69. Be sure to mark the scantron too.*

8 Final Exam

Problem 70. Find the derivative of $x + x\log(x)$.

A.) $1 + x$ **B.)** $2\log(x)$
C.) $2 + \log(x)$ **D.)** $1 + \log(x)$ **E.)** None of the above.

☐ *←Letter corresponding to your answer to problem 70. Be sure to mark the scantron too.*

Problem 71. Which one of the following functions has derivative $\dfrac{2x+1}{x^2+1}$?

A.) $\log(x^2+1) + \arctan(x)$ **B.)** $\log(x^2+1) + \arctan(x^2+1)$
C.) $(2x+1)\log(x^2+1)$ **D.)** $\dfrac{-2x^2-2x+2}{(x^2+1)^2}$ **E.)** None of the above.

☐ *←Letter corresponding to your answer to problem 71. Be sure to mark the scantron too.*

Problem 72. Which one of the following functions has derivative $\dfrac{2x+1}{x^2+x}$?

A.) $(2x+1)\log(x^2+x)$ **B.)** $\log(x+1) - \log(x)$
C.) $\log(x^2+x) + \arctan(x)$ **D.)** $\log(x+1) + \log(x)$ **E.)** None of the above.

☐ *←Letter corresponding to your answer to problem 72. Be sure to mark the scantron too.*

Problem 73. The derivative of $\log|\sec(x) + \tan(x)|$ is

A.) $\dfrac{1}{\sec(x)+\tan(x)}$ **B.)** $\sec(x)$
C.) $\dfrac{\tan(x)}{\sec(x)}$ **D.)** $\dfrac{\tan(x)}{\sec(x)+\tan(x)}$ **E.)** None of the above.

☐ *←Letter corresponding to your answer to problem 73. Be sure to mark the scantron too.*

Problem 74. (This problem was not on the final version of the test.) The derivative of $\log|\sec(x)|$ is

A.) $\tan(x)$ **B.)** $\sec(x)$
C.) $\sec(x)\tan(x)$ **D.)** $\dfrac{\tan(x)}{\sec(x)}$ **E.)** None of the above.

☐ *←Letter corresponding to your answer to problem 74. Be sure to mark the scantron too.*

Problem 75. The derivative of $\log|\tan(x)|$ is

A.) $\dfrac{\sin(x)}{\tan(x)}$ **B.)** $\cot(x)$
C.) $\csc(x) + \sec(x)$ **D.)** $\csc(x)\sec(x)$ **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 75. Be sure to mark the scantron too.*

Problem 76. A 6 foot tall person walks away from a 42 foot tall light at 3.6 feet per second. At what rate is the shadow of the person lengthening?

A.) 0.6 ft/sec **B.)** 0.7 ft/sec
C.) 4.2 ft/sec **D.)** 4.3 ft/sec **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 76. Be sure to mark the scantron too.*

Problem 77. The slope of the tangent line to the curve $2x^2 + 2y^2 = 9xy$ at $(1, 2)$ is

A.) $\frac{4}{5}$ **B.)** $\frac{1}{2}$
C.) $\frac{24}{27}$ **D.)** -7 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 77. Be sure to mark the scantron too.*

Problem 78. A function f is differentiable on the interval $(-1, 17)$. We compute the values of f, f' and f'' at carefully chosen points a and we obtain the table

a	0	1	2	3	4
$f(a)$	1	2	4	3	5
$f'(a)$	1	0	0	0	3
$f''(a)$	1	0	-4	3	2

At what point does f have a local minimum for sure.

A.) 1 **B.)** 3
C.) 4 **D.)** 5 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 78. Be sure to mark the scantron too.*

Problem 79. If $f(x) = (x^2 - x + 1)e^{-x}$ the f has

A.) no local maximum **B.)** a local maximum at 1
C.) no local minimum **D.)** a local maximum at 2 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 79. Be sure to mark the scantron too.*

Problem 80. You travel a certain distance at 60 mph and twice that distance at 30 mph. Your average speed for the whole trip is

A.) 45 mph **B.)** 36 mph
C.) 35 mph **D.)** 34 mph **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 80. Be sure to mark the scantron too.*

Problem 81. Let $g(x) = 3x^5 - 15x^4 + 20x^3 + 45x + 4$. The g is concave up on the interval

A.) $[0, \infty)$ **B.)** $[0, 1]$
C.) $[1, 2]$ **D.)** $(-\infty, 0]$ **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 81. Be sure to mark the scantron too.*

Problem 82. Let $h(x) = 2x^3 + 3x^2 - 36x + 2$. The h is decreasing on the interval

A.) $[-3, 2]$ **B.)** $[0, 3]$
C.) $[0, \infty)$ **D.)** $(-\infty, 0]$ **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 82. Be sure to mark the scantron too.*

Problem 83. Let $f(x) = 3x - 4x^2$. It is easy to find the roots of f of course, but let us pretend that we need to use Newton's method to approximate a root. Let $x_0 = \frac{1}{2}$ and let x_1, x_2, $x_3, \cdots$ be the successive approximations to a root provided bt Newton's method. Find x_2.

A.) $\frac{18}{25}$ **B.)** $\frac{3}{4}$
C.) $\frac{4}{5}$ **D.)** 1 **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 83. Be sure to mark the scantron too.*

Problem 84. We wish to fence in a rectangular plot of area A with a fence running north-south (NS) and east-west (EW). The NS runs are extra heavy fencing that costs twice as much per unit length as the EW fencing. What dimensions should we make our plot to minimize the cost of the fencing?

A.) $\sqrt{2}A^{1/2}$ EW by $A^{1/2}/\sqrt{2}$ NS **B.)** $A^{1/2}/\sqrt{2}$ EW by $\sqrt{2}A^{1/2}$ NS
C.) $2A^{1/2}$ EW by $A^{1/2}/2$ NS **D.)** $2A^{1/2}$ EW by $A^{1/2}$ NS **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 84. Be sure to mark the scantron too.*

Problem 85. Given $\lim_{x \to 0^+} x \log(x) = 0$ find $\lim_{x \to 0^+} x^x$.

A.) 0 **B.)** 1
C.) 2 **D.)** $\frac{\pi}{\sqrt{10}}$ **E.)** None of the above.

☐ ←*Letter corresponding to your answer to problem 85. Be sure to mark the scantron too.*

9 Contact Information

The contact information below is accurate as of Jan 31, 2001.

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