

**Instructions:**  $\implies$ 

If you do not read the instructions, then how will you know what to do? Read them now.

- This test is multiple-choice. You must mark your answer in the box provided. There is no scantron for this test. Before you begin, fill in your name above.
- You may use one 8.5 × 11 inch note sheet prepared in advance. You may write on both sides of your note sheet.
- Note sheets may not be shared. If you do not bring a note sheet you will have to do without any help notes.
- You may not use any books, notebooks, additional note sheets nor note cards.
- You are expected to have a simple scientific calculator available for use on this test. Calculators and other equipment may not be shared.
- You may use a simple graphics calculator but not a laptop computer nor any device capable of extensive symbolic manipulation (other than your own brain).

Be sure to write your name in the space above.

Section number: 060

This document is a list of sample problems for test 1. It includes the actual test header so you can read the instructions in advance. The actual test may, however, be much longer or much shorter.

**Problem 1.** Given functions  $f$  and  $g$  defined by

$$f(x) = \frac{x+1}{3x+2} \quad \text{and} \quad g(x) = \frac{2x-1}{x+1}$$

compute the composition  $(g \circ f)(x) = g(f(x))$ .

- A.)  $\frac{x^2+x-1}{3x^2+5x+2}$     B.)  $\frac{3x}{8x-1}$   
 C.)  $\frac{-x}{4x+3}$     D.)  $\frac{2x-1}{3x+2}$     E.) None of the above.

← Write the letter corresponding to your answer here. (Problem 1).

**Problem 2.** Compute the limit

$$\lim_{t \rightarrow 0} \frac{\sin(2t)}{t}$$

is

- A.)  $\sin(2)$     B.)  $\frac{1}{2}$   
 C.) 1    D.) 2    E.) None of the above.

← Write the letter corresponding to your answer here. (Problem 2).

**Problem 3.** Compute the limit

$$\lim_{x \rightarrow \infty} \frac{3x - \sqrt{4x^2 - 3x + 1}}{x + 3}$$

- A.) 0    B.) 1  
 C.) 3    D.) 5    E.) None of the above.

← Write the letter corresponding to your answer here. (Problem 3).

**Problem 4.** The equation  $x^3 - x^2 + x = 6.1$  has a solution in the interval

- A.)  $[0, 1]$     B.)  $[1, 2]$   
C.)  $[2, 3]$     D.)  $[3, 4]$     E.) None of the above.

←Write the letter corresponding to your answer here. (Problem 4).

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**Problem 5.** The function  $f$  defined by

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

is

- A.) continuous at 0    B.) not continuous at 0  
C.) odd    D.) undefined at 0    E.) None of the above.

←Write the letter corresponding to your answer here. (Problem 5).

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**Problem 6.** Assume the distance  $s$  that a certain body falls in  $t$  seconds is given (in feet) by

$$s = 16t^2 + 28t, \quad (t \geq 0).$$

Find the (instantaneous) downward speed at which the body is falling at the very moment that it has fallen 120 feet.

- A.) 60 ft/sec    B.) 92 ft/sec  
C.) 144 ft/sec    D.) 156 ft/sec    E.) None of the above.

←Write the letter corresponding to your answer here. (Problem 6).

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**Problem 7.** Find the slope of the tangent line to the graph of  $y = \sin(x)$  at  $x = \frac{3}{4}\pi$ .

- A.) 0    B.)  $\sqrt{2}/2$   
C.)  $-\sqrt{2}/2$     D.)  $-1$     E.) None of the above.

←Write the letter corresponding to your answer here. (Problem 7).

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**Problem 8.** Compute the limit

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

- A.)  $-7/3$     B.)  $-3/11$   
C.)  $1/2$     D.) 1    E.) None of the above.

←Write the letter corresponding to your answer here. (Problem 8).

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**Problem 9.** If the function  $f$  is defined by  $f(x) = 1/x^2$  compute the derivative  $f'(x)$ .

- A.)  $-\frac{2}{x^3}$     B.)  $-\frac{2}{x}$   
C.)  $\frac{2}{x^3}$     D.)  $-\frac{1}{x^3}$     E.) None of the above.

←Write the letter corresponding to your answer here. (Problem 9).

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**Problem 10.** Let  $f$  be a differentiable function and suppose  $f(1) = 0$ ,  $f(2) = 1$ ,  $f'(1) = 2$  and  $f'(2) = 3$ . Compute the limit

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

- A.) 0    B.) 1  
C.) 2    D.) 3    E.) None of the above.

←Write letter corresponding to your answer here and mark it on the scantron (Problem 10).

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**Problem 11.** If a particle travels a distance  $s(t)$  feet in time  $t$  seconds then the velocity  $v(t)$  is the instantaneous rate of change

$$v(t) = \lim_{h \rightarrow 0} \frac{s(t+h) - s(t)}{h}$$

and the acceleration  $a(t)$  is the instantaneous rate of change

$$a(t) = \lim_{h \rightarrow 0} \frac{v(t+h) - v(t)}{h}.$$

The *jerk*  $j(t)$  is defined to be the instantaneous rate of change of the acceleration,

$$j(t) = \lim_{h \rightarrow 0} \frac{a(t+h) - a(t)}{h}.$$

If  $s(t) = 2t^4$  find the jerk  $j(2)$  at time  $t = 2$ .

- A.) 16 ft/sec<sup>3</sup>    B.) 32 ft/sec<sup>3</sup>  
C.) 64 ft/sec<sup>3</sup>    D.) 0 ft/sec<sup>3</sup>    E.) None of the above.

←Write the letter corresponding to your answer here. (Problem 11).

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Use this page and the backs of all the pages for scratch work.