

**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 on the provided scantron. Before you begin, fill in all the required information on the scantron.
- Fill in the appropriate bubbles for your information and for your answers on the scantron very carefully.
- 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 enter all required information on the scantron.

Section number: 060

**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  $(f \circ g)(x) = f(g(x))$ .

- 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 letter corresponding to your answer here and mark it on the scantron (Problem 1).

**Problem 2.** Compute the limit

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

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

← Write letter corresponding to your answer here and mark it on the scantron (Problem 2).

**Problem 3.** Compute the limit

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

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

← Write letter corresponding to your answer here and mark it on the scantron (Problem 3).

**Problem 4.** The equation  $x^3 - x^2 + x = 5.9$  has a solution in the interval

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

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

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

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

is

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

←Write letter corresponding to your answer here and mark it on the scantron (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

$$s = 16t^2 + 20t, \quad (t \geq 0).$$

Find the (instantaneous) downward speed at which the body is falling at the very moment that it has fallen 24 feet.

- A.) 20 ft/sec    B.) 32 ft/sec  
C.) 44 ft/sec    D.) 56 ft/sec    E.) None of the above.

←Write letter corresponding to your answer here and mark it on the scantron (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.)  $-1$     B.)  $-\sqrt{2}/2$   
C.)  $\sqrt{2}/2$     D.)  $0$     E.) None of the above.

←Write letter corresponding to your answer here and mark it on the scantron (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.)  $-3/11$     B.)  $1/2$   
C.)  $-7/3$     D.)  $1$     E.) None of the above.

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

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