I was more interested in skating and the girls and traveling than I was in calculus. - Scott Hamilton, professional figure skater

This quiz is out of 10 points (each question is worth 2 points each). No partial credit will be given. Credit will be given based solely on your final answer. Please write your final answer on this sheet. You may perform your work on another sheet of paper. You will be given 15 minutes to complete the quiz.

1. Find \( \frac{d}{dx} (\arcsin 2x) \)

Solution. By Chain rule, this is equal to \( \frac{2}{\sqrt{1 - 4x^2}} \).

2. Suppose that \( f \) is a function that is defined for all real numbers. Which of the following assures that \( f \) has an inverse function?

a) The function \( f \) is periodic.

b) The graph of \( f \) is symmetric with respect to the \( y \)-axis.

c) The graph of \( f \) is concave up.

d) The function \( f \) is a strictly increasing function.

e) The function \( f \) is continuous.

The answer is (d).

3. Given the function defined by \( f(x) = 3x^5 - 20x^3 \), find all values of \( x \) for which the graph of \( f \) is concave up.

a) \( x > 0 \)

b) \( -\sqrt{2} < x < 0 \) or \( x > \sqrt{2} \)

c) \( -2 < x < 0 \) or \( x > 0 \)

d) \( x > \sqrt{2} \)
e) $-2 < x < 2$

The graph $f$ is concave up at $x$ if and only if $f''(x) > 0$. If we take the second derivative of $f$, we obtain $60x(x^2 - 2)$. Therefore, the roots are $0, \pm \sqrt{2}$. Checking the appropriate intervals, we find that the answer must be $(b)$.

4. If $f(x) = |\sin x - \frac{1}{2}|$, then find the maximum value attained by $f$.

The answer is clearly $\frac{3}{2}$.

5. Suppose that $f$ is an odd function; i.e., $f(-x) = -f(x)$ for all $x$. Suppose that $f'(x_0)$ exists. Which of the following must necessarily be equal to $f'(-x_0)$?

   a) $f'(x_0)$
   b) $-f'(x_0)$
   c) $\frac{1}{f'(x_0)}$ or $x > 0$
   d) $\frac{-1}{f'(x_0)}$
   e) None of the above

The answer is clearly $(a)$. 