Math 1400 - Quiz #3 TakeHome
Fall 2009

Row _ Name _ Solutions Q # 3 _ Score: __

This quiz is due on Thursday, September 22 at noon. Put your quiz in my mailbox, which is in the hallway outside of the MATH office, CU340. My name is on the mailbox, which also is numbered #26.

Show only neat work on this paper. Messy work will not get credit.
Extra copies of the quiz are available on D2L.

Q1: Use the definition of the derivative to find the derivative of the function \( f(x) \). You must use good notation. You may simplify the value of \( f(x + h) \) off to the side, but you must show your work.

For \( f(x) = 2x^3 - 4x \) find \( f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \)

\[
= \lim_{h \to 0} \frac{2(x + h)^3 - 4(x + h) - (2x^3 - 4x)}{h}
\]

\[
= \lim_{h \to 0} \frac{2(x^3 + 3x^2h + 3xh^2 + h^3) - 4(x + h) - (2x^3 - 4x)}{h}
\]

\[
= \lim_{h \to 0} \frac{2x^3 + 6x^2h + 6xh^2 + 2h^3 - 4x - 4h - 2x^3 + 4x}{h}
\]

\[
= \lim_{h \to 0} \frac{6x^2h + 6xh^2 + 2h^3 - 4h}{h}
\]

\[
= \lim_{h \to 0} (6x^2 + 6x + 2h^2 - 4) h
\]

\[
= 6x^2 + 6x(0) + 2(0)^2 - 4
\]

\[
= 6x^2 - 4
\]
Q2: Find the derivatives. Put a box around your final answer.

A. Find y' for \( y = \frac{7}{t} + \frac{t}{7} \)
\[
y = \frac{7}{t} - \frac{1}{7}
y' = \frac{-7}{t^2} + \frac{1}{49}
\]

B. Find \( f'(s) \) for \( f(s) = \sqrt[3]{s^2} \)
\[
f(s) = \frac{2}{3} s^{-\frac{1}{3}}
f'(s) = \frac{2}{3} \frac{1}{\sqrt[3]{s}}
\]

Q3: For the function \( f(x) = 2x^2 - 5x + 1 \) find \( f'(x) \) answer A - C.

A. Find \( f'(x) = 4x - 5 \)

B. At what value of \( x \) does the graph have a horizontal tangent?
Sketch this tangent line on the graph
\[
4x - 5 = 0 \\
4x = 5 \\
\Rightarrow x = \frac{5}{4}
\]

C. Find the equation of the tangent line at \( x = 1 \). Sketch this tangent line.
\[
f(1) = 2(1)^2 - 5(1) + 1 = -2 \\
f'(1) = 4(1) - 5 = -1
\]
\[
y - (-2) = -1(x - 1) \\
y + 2 = -x + 1 \\
y = -x - 1
\]

Q4: The body temperature, in degrees Fahrenheit, of a patient \( t \) hours after being given a fever - reducing drug is given by \( F(t) = 0.16t^2 - 1.6t + 104 \)

A. Find \( F(1) \) and \( F'(1) \) (calculator answers are OK)
and write a brief verbal interpretation of these numbers.
Be sure to label numerical values.
\[
F(1) = \frac{102.56}{ } \\
F'(1) = -1.28
\]

After 1 hour the patient's temperature is 102.56°F
and is decreasing at a rate of 1.28°F per hour.

B. Use DIFFERENTIALS to approximate \( F(1.5) \). List the following values:
\[
\Delta x = 0.5 \\
dx = \Delta x = 0.5 \\
dy = f'(1) dx = (-1.28)(0.5) = -0.64
\]
\[
F(1.5) = F(1) + dy = 102.56 + (-0.64) = 101.92
\]

(no credit will be given for a calculator answer for \( F(1.5) \))
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Q1: Use the definition of the derivative to find the derivative of the function $f(x)$. You must use good notation. You may simplify the value of $f(x + h)$ off to the side, but you must show your work.

For $f(x) = 2x^3 - 4x$ find $f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$
Q2: Find the derivatives. Put a box around your final answer.

A. Find \( y' \) for \( y = \frac{7}{t} + \frac{t}{7} \)

B. Find \( f'(s) \) for \( f(s) = \sqrt[3]{s^2} \)

Q3: For the function \( f(x) = 2x^2 - 5x + 1 \) find \( f'(x) \) answer A - C.

A. Find \( f'(x) = \) ______________________________

B. At what value of \( x \) does the graph have a horizontal tangent? Sketch this tangent line on the graph

C. Find the equation of the tangent line at \( x = 1 \). Sketch this tangent line.

Q4: The body temperature, in degrees Fahrenheit, of a patient \( t \) hours after being given a fever – reducing drug is given by \( F(t) = 0.16t^2 - 1.6t + 104 \)

A. Find \( F(1) \) and \( F'(1) \) (calculator answers are OK) and write a brief verbal interpretation of these numbers. Be sure to label numerical values.

\[ F(1) = \] __________  
\[ F'(1) = \] __________

B. Use DIFFERENTIALS to approximate \( F(1.5) \). List the following values:

\[ \Delta x = \] _____  
\[ dx = \] _____  
\[ dy = \] ________________________________

\[ F(1.5) \approx \] ___________________________  (no credit will be given for a calculator answer for \( F(1.5) \)