MATH-115 SPRING 2010 FINAL EXAM

FIRST: PRINT YOUR LAST NAME IN LARGE CAPITAL LETTERS ON THE UPPER RIGHT CORNER OF THIS SHEET.
SECOND: PRINT YOUR FIRST NAME IN CAPITAL LETTERS DIRECTLY UNDERNEATH YOUR LAST NAME.
THIRD: WRITE YOUR SPRING 2010 MATH-115 SECTION NUMBER DIRECTLY UNDERNEATH YOU FIRST NAME.
FOURTH: PRINT THE NAME OF YOUR MATH-115 INSTRUCTOR UNDERNEATH YOUR SECTION NUMBER IN LARGE CAPITALS.

8AM-NOON FRIDAY 30 APRIL 2010

ANSWER SHEET: Circle the correct answers to each question on this sheet and on the test question sheets.

1) A B C D
2) A B C D
3) A B C D
4) A B C D
5) A B C D
6) A B C D
7) A B C D
8) A B C D
9) A B C D
10) A B C D
11) A B C D
12) A B C D
13) A B C D
14) A B C D
15) A B C D
16) A B C D
17) A B C D
18) A B C D
19) A B C D
20) A B C D
In problems 1-4 suppose \( f \) is the function
\[ f(t) = 3t^2 - 5t - 2. \]

1. The value of \( f \) at \( t = 2 \) is
A) 12
B) 0
C) 2
D) -4

2. The derivative of \( f \) is the function \( f' \) given by
A) \( f'(t) = 3t - 5 - 2 \)
B) \( f'(t) = 6t - 5t \)
C) \( f'(t) = 6t - 5 \)
D) \( f'(t) = 6t - 5 - 2 \).
3. The slope of the tangent line to the graph of \( f \) at the point \((2, f(2))\) is

A) 0  
B) 2  
C) -7  
D) 7

4. The equation of the tangent line to the graph of \( y = f(t) \) at the point \((2, f(2))\) is

A) \( y = 7(t - 2) \)  
B) \( y = 2(t - 7) \)  
C) \( y = 0 \)  
D) \( y = 7t \)

For problems 5 and 6 suppose that \( G(x, y) = x^2y \), where \( x \) and \( y \) are functions of time \( t \), and further, suppose that \( x(5) = 3 \), that \( y(5) = 2 \), that \( x'(5) = 4 \), and that \( y'(5) = 7 \). Define the function \( h \) by the rule \( h(t) = G(x(t), y(t)) = [x(t)]^2[y(t)]. \)

5. The value of \( h \) at \( t = 5 \) is

A) 9  
B) 6  
C) 18  
D) 12

6. The value of \( h' \) at \( t = 5 \) is

A) \( 4^2 \cdot 7 \)  
B) \( 4^2 \cdot 5 + 5 \cdot 7 \)  
C) \( 2 \cdot 3 \cdot 4 \cdot 2 \cdot 5 + 3^2 \cdot 7 \cdot 5 \)  
D) \( 2 \cdot 3 \cdot 4 \cdot 2 + 3^2 \cdot 7 \)
7. A car is moving through a busy intersection. At the instant the car’s front bumper crosses the edge of the cross-walk the car is moving at the rate of 30 miles per hour and at that instant the driver takes his foot off the accelerator pedal. Two tenths of a second later the driver hits his brakes. Assuming the car’s acceleration is negligible during the time between the instant the driver removes his foot from the accelerator pedal and the time his foot hits the brakes, how far will the car go past the edge of the cross walk before the driver hits his brakes? (Hint: 30 miles per hour is 44 feet per second)

A) 8.8 feet  
B) 4.4 feet  
C) 2.2 feet  
D) 44 feet

8. If \( f(x) = (5 + x^2)^\pi \), then \( f'(x) = \\
A) 2x\pi(5 + x^2)^{\pi-1} \\
B) 2x(\pi - 1)(5 + x^2)^\pi \\
C) 3x^2(\pi)(5 + x^2)^{\pi+1} \\
D) \frac{x^3(5 + x^2)^{\pi+1}}{3(\pi + 1)}

9. If \( g(x) = e^{x^3} \), then \( g'(x) = \\
A) x^3e^{x^3-1} \\
B) 3x^2e^{x^3} \\
C) e^{3x^2} \\
D) \frac{e^{x^3+1}}{x^3 + 1}
10. If \( h(x) = x^2\sqrt{x^5+2x+1} \), then \( h'(x) = \\
A) 2x \cdot \frac{1}{2} (5x^4 + 2)^{-1/2} \\
B) 2x \cdot \frac{1}{2} (x^5 + 2x + 1)^{-1/2} (5x^4 + 2) \\
C) 2x \cdot \sqrt{x^5 + 2x + 1} + x^2 \cdot \frac{1}{2} (\sqrt{x^5 + 2x + 1}^{-1} (5x^4 + 2) \\
D) 2x \cdot \sqrt{x^5 + 2x + 1} + x^2 \cdot \frac{1}{2} (x^5 + 2x + 1)^{-1/2} (5x^4 + 2x + 1)

In problems 11-14 suppose that \\
\( Y(t) = (1000) \cdot e^{(12)t} \) \\
gives the value of an investment in dollars after \( t \) years.

11. The value of \( Y \) when \( t = 0 \) is \\
A) 1000 \\
B) (1000)(e) \\
C) (1000)(e^{12}) \\
D) None of the above.

12. The value of \( Y \) when \( t = 5 \) is \\
A) (1000) \cdot e^{(5)} \\
B) (1000) \cdot e^{(6)} \\
C) (1000) \cdot e^{(5)} \\
D) (500) \cdot e^{(6)}

13. The rate of change of the value of the investment at time \( t \) is \\
A) \( Y(t) = (.12) \cdot e^{(12)t} \) \\
B) \( Y(t) = (1.2) \cdot e^{(12)t} \) \\
C) \( Y(t) = (12) \cdot e^{(12)t} \) \\
D) \( Y(t) = (120) \cdot e^{(12)t} \)
14. The time it will take for this investment to double in value is
   A) $\ln 2$
   B) $(.12) \ln 2$
   C) $2 \ln(.12)$
   D) $(\ln 2)/(.12)$

15. If $f(x) = \ln(x^5 + 7)$, then $f'(x) =$
   A) $(5x + 7) \cdot \ln(x^5 + 7)$
   B) $(5x^4) \cdot \ln(x^5 + 7)$
   C) $(5x + 7)/(\ln(x^5 + 7))$
   D) $(5x^4)/(x^5 + 7)$

16. If $f'(x) = (10)x^4$ and $f(2) = 60$, then $f(x) =$
   A) $\frac{1}{5}x^5 + 60 - \frac{32}{5}$
   B) $2x^5 + 60 - 64$
   C) $(40)x^3 + 60 - 320$
   D) $2x^5 + 60$
In problems 17 and 18, $A$ denotes the area of the region bounded by the curves $x = 1$, $x = 3$, $y = 0$, and $y = g(x)$ where $g$ is a function.

17. If $g(x) = (12) \cdot x^2 + 5$, then $A =$
   A) 114
   B) 123
   C) $(114)/4$
   D) $(12)/5$

18. If $g(x) = -G'(x)$ and $G(1) = 3 \cdot G(3) = 15$, then $A =$
   A) 15
   B) 10
   C) 5
   D) 0

19. $\int \frac{1}{x \ln x} \, dx =$
   A) $(\ln x)^{-1} + C$
   B) $\ln(x^{-1}) + C$
   C) $\ln(\ln x) + C$
   D) $\ln(\ln(\ln x)) + C$

20. $\int_0^1 (2x) \cdot e^{x^2} \cdot \ln(1 + x^2) \cdot \frac{1}{5 + x^2} \, dx$ is NOT EQUAL TO
   A) $\int_0^1 e^u \cdot \ln(1 + u) \cdot \frac{1}{5 + u} \, du$
   B) $\int_0^1 e^{u-1} \cdot \ln(u) \cdot \frac{1}{4 + u} \, du$
   C) $\int_5^6 \frac{e^{u}}{e^5} \cdot \ln(u - 4) \cdot \frac{1}{u} \, du$
   D) $\int_1^2 \frac{e^{u}}{e} \cdot \ln(u) \cdot \frac{1}{4 + u} \, du$