Name: _____ Class: _____ Date: _____ ID: A

Product (M86.3g) and Quotient (M86.3h) Rule Practice

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. **M86.3g or M86.3i**
   AP 2008 MC #3 - No Calc
   If $f(x) = (x-1)\left(x^2+2\right)^3$, then $f'(x) =$

   (A) $6x\left(x^2+2\right)^2$

   (B) $6x(x-1)\left(x^2+2\right)^2$

   (C) $\left(x^2+2\right)^2\left(x^2+3x-1\right)$

   (D) $\left(x^2+2\right)^2\left(7x^2-6x+2\right)$

   (E) $-3(x-1)\left(x^2+2\right)^2$

   a. A
   b. B
   c. C
   d. D
   e. E

2. **M86.3h**
   AP Practice MC #11 - No Calc

   . What is the slope of the line tangent to the graph of $y = \dfrac{e^{-x}}{x+1}$ at $x = 1$?

   (A) $-\dfrac{1}{e}$ (B) $-\dfrac{3}{4e}$ (C) $-\dfrac{1}{4e}$ (D) $\dfrac{1}{4e}$ (E) $\dfrac{1}{e}$

   a. A
   b. B
   c. C
   d. D
   e. E

3. **M86.3h**
AP 2003 MC #4 - No Calc

If $y = \frac{2x+3}{3x+2}$, then $\frac{dy}{dx} =$

(A) $\frac{12x+13}{(3x+2)^2}$ (B) $\frac{12x-13}{(3x+2)^2}$ (C) $\frac{5}{(3x+2)^2}$ (D) $\frac{-5}{(3x+2)^2}$ (E) $\frac{2}{3}$

a. A
b. B
c. C
d. D
e. E

4. **M86.3g**
AP 2003 MC #14 - No Calc

If $y = x^2 \sin 2x$, then $\frac{dy}{dx} =$

(A) $2x \cos 2x$
(B) $4x \cos 2x$
(C) $2x(\sin 2x + \cos 2x)$
(D) $2x(\sin 2x - x \cos 2x)$
(E) $2x(\sin 2x + x \cos 2x)$

a. A
b. B
c. C
d. D
e. E

5. **M86.3g**
AP Practice MC #89 - Calc OK

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	–2	–3	4

The table above gives values of the differentiable functions f and g and their derivatives at $x = 1$. If $h(x) = (2f(x) + 3)(1 + g(x))$, then $h'(1) =$

(A) –28 (B) –16 (C) 40 (D) 44 (E) 47

a. A
b. B
c. C
d. D
e. E

6. **M86.3h**
AP 1998 MC #10 - No Calc

What is the instantaneous rate of change at $x = 2$ of the function f given by $f(x) = \frac{x^2 - 2}{x - 1}$?

(A) -2 (B) $\frac{1}{6}$ (C) $\frac{1}{2}$ (D) 2 (E) 6

a. A
b. B
c. C
d. D
e. E

7. **M86.3g**
AP 1997 MC #2 - No Calc

If $f(x) = x\sqrt{2x-3}$, then $f'(x) =$

(A) $\frac{3x-3}{\sqrt{2x-3}}$

(B) $\frac{x}{\sqrt{2x-3}}$

(C) $\frac{1}{\sqrt{2x-3}}$

(D) $\frac{-x+3}{\sqrt{2x-3}}$

(E) $\frac{5x-6}{2\sqrt{2x-3}}$

a. A
b. B
c. C
d. D
e. E

8. **M86.3h**
AP 1997 MC #76 - Calc OK

If $f(x)=\frac{e^{2x}}{2x}$, then $f'(x)=$

(A) 1

(B) $\frac{e^{2x}(1-2x)}{2x^2}$

(C) e^{2x}

(D) $\frac{e^{2x}(2x+1)}{x^2}$

(E) $\frac{e^{2x}(2x-1)}{2x^2}$

a. A
b. B
c. C
d. D
e. E

9. **M86.3h and M86.2d**
AP 1993 MC #7 - No Calc

An equation of the line tangent to the graph of $y=\frac{2x+3}{3x-2}$ at the point $(1,5)$ is

(A) $13x-y=8$ (B) $13x+y=18$ (C) $x-13y=64$

(D) $x+13y=66$ (E) $-2x+3y=13$

a. A
b. B
c. C
d. D
e. E

10. **M86.3g**
AP 1993 MC #10 - No Calc

If $f(x)=(x-1)^2\sin x$, then $f'(0)=$

(A) –2 (B) –1 (C) 0 (D) 1 (E) 2

a. A
b. B
c. C
d. D
e. E

Name: _____ ID: A

11. CHALLENGE

M86.3g and M86.2d
AP 2003 MC #89 - Calc OK

. Let f be a differentiable function with $f(2) = 3$ and $f'(2) = -5$, and let g be the function defined by $g(x) = xf(x)$. Which of the following is an equation of the line tangent to the graph of g at the point where $x = 2$?

(A) $y = 3x$

(B) $y - 3 = -5(x - 2)$

(C) $y - 6 = -5(x - 2)$

(D) $y - 6 = -7(x - 2)$

(E) $y - 6 = -10(x - 2)$

a. A
b. B
c. C
d. D
e. E

12. CHALLENGE

M86.3g
AP 1998 MC #8 - No Calc

Let f and g be differentiable functions with the following properties:

(i) $g(x) > 0$ for all x
(ii) $f(0) = 1$

If $h(x) = f(x)g(x)$ and $h'(x) = f(x)g'(x)$, then $f(x) =$

(A) $f'(x)$ (B) $g(x)$ (C) e^x (D) 0 (E) 1

a. A
b. B
c. C
d. D
e. E

Product (M86.3g) and Quotient (M86.3h) Rule Practice
Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1 STA: M86.3g | M86.3i
   LOC: M.E.86.3g | M.E.86.3i
2. ANS: B PTS: 1 STA: M86.3h LOC: M.E.86.3h
3. ANS: D PTS: 1 LOC: M.E.86.3h
4. ANS: E PTS: 1 LOC: M86.3g
5. ANS: D PTS: 1 STA: M86.3g LOC: M.D.86.3g
6. ANS: D

   D $f'(x)=\dfrac{(x-1)(2x)-(x^2-2)(1)}{(x-1)^2};\ f'(2)=\dfrac{(2-1)(4)-(4-2)(1)}{(2-1)^2}=2$

   PTS: 1 LOC: M.E.86.3h
7. ANS: A

   A $f(x)=x(2x-3)^{\frac{1}{2}};\quad f'(x)=(2x-3)^{\frac{1}{2}}+x(2x-3)^{-\frac{1}{2}}=(2x-3)^{-\frac{1}{2}}(3x-3)=\dfrac{(3x-3)}{\sqrt{2x-3}}$

   PTS: 1
8. ANS: E

   E $f(x)=\dfrac{e^{2x}}{2x};\ f'(x)=\dfrac{2e^{2x}\cdot 2x-2e^{2x}}{4x^2}=\dfrac{e^{2x}(2x-1)}{2x^2}$

   PTS: 1
9. ANS: B

   B $y'=\dfrac{2\cdot(3x-2)-(2x+3)\cdot 3}{(3x-2)^2};\ y'(1)=-13$. Tangent line: $y-5=-13(x-1)\Rightarrow 13x+y=18$

   PTS: 1
10. ANS: D

    D $f'(x)=2(x-1)\cdot\sin x+(x-1)^2\cos x;\ f'(0)=(-2)\cdot 0+1\cdot 1=1$

    PTS: 1
11. ANS: D PTS: 1

12. ANS: E

E $h(x) = f(x)g(x)$ so, $h'(x) = f'(x)g(x) + f(x)g'(x)$. It is given that $h'(x) = f(x)g'(x)$. Thus, $f'(x)g(x) = 0$. Since $g(x) > 0$ for all x, $f'(x) = 0$. This means that f is constant. It is given that $f(0) = 1$, therefore $f(x) = 1$.

PTS: 1 LOC: M86.3g