MAT 2233	Name: _____
Chapter 4	Date: _____
Exam (V1)	Section: _____

Please clearly indicate your answers. Please show your work on a separate sheet paper in an organized manner. Each problem is worth 6 points. The exam is worth 100 points.

1. Find $f'(x)$ if $f(x) = (x^5 + 3)(x^5 - 6)$.

    A. $25x^8$
    B. $10x^9$
    C. $x^{10} - 18$
    D. $10x^9 - 15x^4$
    ANSWER: D

2. If $h(x) = (x^4 - 2)(x^3 - 1)(x^2 + 1)$, then $h'(-1)$ equals:

    A. 3
    B. 6
    C. 10
    D. –6
    ANSWER:B

3. Calculate $\dfrac{dy}{dx}\left(\dfrac{x+1}{2x-1}\right)$. You need not expand your answer.

    ANSWER: $y' = \dfrac{(2x-1)(1) - (x+1)(2)}{(2x-1)^2} = \dfrac{3}{(2x-1)^2}$

4. If $y = \sqrt{4x^2 + 11}$, then $y' = $ _____ .

    A. $\dfrac{1}{\sqrt{4x^2 + 11}}$ B. $\dfrac{8x}{\sqrt{4x^2 + 11}}$

    C. $\dfrac{4x}{\sqrt{4x^2 + 11}}$ D. $\dfrac{8x + 11}{\sqrt{4x^2 + 11}}$

    ANSWER: C

5. If $y = \dfrac{3}{(x^3 + 3x)^3}$, then $y' = $ _____.

    A. $\dfrac{-9x^2}{(x^3 + 3x)^4}$ B. $\dfrac{18x^2}{(x^3 + 3x)^4}$

    C. $\dfrac{3}{(x^3 + 3x)^4}$ D. $\dfrac{-27(x^2 + 1)}{(x^3 + 3x)^4}$

    ANSWER: d

6. Find the derivative of $y = (x+3)(4x-2)^4$.

   A. $4(4x-2)^3$ B. $16(4x-2)^3$

   C. $32x(4x^2-6)^3$ D. $(4x-2)^3(20x+46)$

ANSWER: D

7. Find the equation of the tangent line to the graph of $y = \left(-2x^2 + x - 2\right)^3$ at the point (1, -3).

ANSWER: $y+3 = -8(x-1)$ or $y = -81x + 78$

8. If $y = \dfrac{e^x}{x^2}$, then $\dfrac{dy}{dx} =$

   A. $\dfrac{e^x}{x^3}$ B. $\dfrac{e^x}{x^2} - \dfrac{2e^x}{x^3}$

   C. $\dfrac{e^x}{x^3} + \dfrac{2e^x}{x^2}$ D. $2e^x - \dfrac{x}{x^3}$

ANSWER: B

9. If $f(x) = x^2 \ln x$, then $f'(x)$ equals:

   A. $2\ln x + x$ B. $2x$

   C. $2x\ln x$ D. $x + 2x\ln x$

ANSWER: D

10. If $y = x \cdot 3^x$, then $y' =$

   A. $3^x \ln 3$

   B. $x \cdot 3^{x-1} + 1$

   C. $3^x (x \ln 3 + 1)$

   D. $x^3 \cdot 3^{x-1} + x^x$

ANSWER: C

11. Find the derivative of the function $f(x) = \ln|3 - x|$.

ANSWER: $f'(x) = \dfrac{-1}{3-x} = \dfrac{1}{x-3}$

12. Find the derivative of the function $f(x) = e^{\sqrt{5x-2}}$.

ANSWER: $f'(x) = \dfrac{5e^{\sqrt{5x-2}}}{2\sqrt{5x-2}}$

13. If $y = \ln x + \sqrt{\ln x}$, then find y'.

ANSWER: $\dfrac{1}{2x}\left(1 + \dfrac{1}{\sqrt{\ln x}}\right)$

14. Find $\dfrac{dy}{dx}$ if $xy + x = 9$ using implicit differentiation.

A. $\dfrac{9-y}{x}$

B. $\dfrac{y+1}{-x}$

C. $\dfrac{y-1}{x}$

D. $\dfrac{-y-9}{-x}$

ANSWER: B

15. Given $(y+1)^4 = (x-1)^3$, find $\dfrac{dy}{dx}$ using implicit differentiation.

A. $\dfrac{3x(x-1)^2}{4y(y+1)^3}$

B. $\dfrac{(y+1)^3}{(x-1)^2}$

C. $\dfrac{3(x-1)^2}{4(y+1)^3}$

D. $\dfrac{4(y+1)^3}{3(x-1)^2}$

ANSWER: C

16. Use logarithmic differentiation to find $\dfrac{dy}{dx}$ when $y = \dfrac{1-3x}{1+4x}$.

ANSWER: $\ln y = \ln\left[\dfrac{1-3x}{(1+4x)^2}\right] = \ln(1-3x) - \ln(1+4x) \Rightarrow y'(x) = \dfrac{-7}{(1+4x)^2}$

BONUS PROBLEMS   4 points each   all or nothing

1. Find the equation of a tangent line to the graph of $y = x^2 + 4\ln x$, which is parallel to the line $y = 6x - 3$.

   ANSWER: $y = 6x - 5$ or $y = 6x - 8 + 4\ln 2$

2. Find $\dfrac{dy}{dx}$ when $xy + x^2 y^2 + x^3 y^3 = 5$ using implicit differentiation.

   ANSWER: $\dfrac{dy}{dx} = -\dfrac{3x^2 y^3 + 2xy^2 + y}{3x^3 y^2 + 2x^2 y + x}$

3. Calculate $\dfrac{dy}{dx}\left(\dfrac{x^3 - \sqrt{x}}{x^2 - 2\sqrt{x}}\right)$. You need not expand your answer.

   ANSWER: $y' = \dfrac{(x^2 - 2x^{0.5})(3x^2 - 0.5x^{-0.5}) - (x^3 - x^{0.5})(2x - x^{-0.5})}{(x^2 - 2x^{0.5})^2} = \dfrac{\sqrt{x}\,(2x^{5/2} - 10x + 3)}{2(x^{3/2} - 2)^2}$