Name: Solutions
Class: ______
Date: ______

ID: A

MAC 2233 Chapter 4 Review for the test

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

____ 1. Find the derivative of the function.

$g(x) = 5x^{-3} + 6x^{-6}$

a. $g'(x) = 5x^{-3} + 6x^{-6}$
b. $g'(x) = -15x^{-3} - 36x^{-6}$
c. $g'(x) = 15x^{-4} + 36x^{-7}$
d. $g'(x) = -5x^{-4} - 6x^{-7}$
e. $\boxed{g'(x) = -15x^{-4} - 36x^{-7}}$

$$g'(x) = 5(-3)x^{-3-1} + 6(-6)x^{-6-1} = \boxed{-15x^{-4} - 36x^{-7}}$$

____ 2. Find the derivative of the function.

$r(x) = \frac{2x}{7} - \frac{x^{0.3}}{2} + \frac{4}{7x^{1.3}} - 4$

a. $r'(x) = \frac{2}{7} - \frac{0.3}{2x^{0.3}} - \frac{5.2}{7x^{1.3}}$
b. $r'(x) = \frac{2}{7} - \frac{0.3x^{0.7}}{2} + \frac{5.2x^{2.3}}{7}$
c. $r'(x) = \frac{2}{7} - \frac{0.3x^{1.3}}{2} - \frac{5.2}{7x^{0.3}}$
d. $r'(x) = \frac{2}{7} - \frac{0.3}{2x^{0.7}} + \frac{5.2}{7x^{2.3}}$
e. $\boxed{r'(x) = \frac{2}{7} - \frac{0.3}{2x^{0.7}} - \frac{5.2}{7x^{2.3}}}$

$$= \frac{2}{7}x - \frac{1}{2}x^{0.3} + \frac{4}{7}x^{-1.3} - 4$$

$$r'(x) = \frac{2}{7} - \frac{1}{2}(0.3)x^{0.3-1} + \frac{4}{7}(-1.3)x^{-1.3-1}$$

$$= \frac{2}{7} - \frac{0.3}{2}x^{-0.7} - \frac{5.2}{7}x^{-2.3}$$

$$= \boxed{\frac{2}{7} - \frac{0.3}{2x^{0.7}} - \frac{5.2}{7x^{2.3}}}$$

____ 3. Find the derivative of the function.

$s(x) = 2\sqrt{x} + \frac{39}{\sqrt{x}}$ $= 2x^{1/2} + 39x^{-1/2}$

$s'(x) = 2(\frac{1}{2})x^{\frac{1}{2}-1} + 3(-\frac{1}{2})x^{-\frac{1}{2}-1}$

$= x^{-1/2} - \frac{3}{2}x^{-3/2}$

$= \frac{1}{\sqrt{x}} - \frac{3}{2x^{3/2}}$

$= \boxed{\frac{1}{\sqrt{x}} - \frac{39}{2x\sqrt{x}}}$ with $\frac{39}{2} = 19.5$

$x^{3/2} = \sqrt[2]{x^3} = x\sqrt{x}$

a. $s'(x) = \frac{1}{\sqrt{x}} + \frac{19.5}{x\sqrt{x}}$
b. $s'(x) = \frac{1}{\sqrt{x}} + \frac{19.5}{x\sqrt{x}}$
c. $s'(x) = \frac{2}{\sqrt{x}} - \frac{39}{x\sqrt{x}}$
d. $\boxed{s'(x) = \frac{1}{\sqrt{x}} - \frac{19.5}{x\sqrt{x}}}$
e. $s'(x) = \frac{1}{\sqrt{x}} + \frac{39}{x\sqrt{x}}$

____ 4. Find the slope of the tangent to the graph of the given function $f(x) = 2x^3$ at the point (-3, -54).

a. $\boxed{f'(-3) = 54}$
b. $f'(-3) = -162$
c. $f'(-3) = -18$
d. $f'(-3) = 18$
e. $f'(-3) = 0$

$f'(x) = 2(3)x^{3-1} = 6x^2$

$f'(-3) = 6(-3)^2 = \boxed{54 = m_{tan}}$

____ 5. Find the slope of the tangent to the graph of the given function at the indicated point.

$g(t) = \frac{7}{t^3}$, (0.5, 56)

$g(t) = 7t^{-3}$

$g'(t) = -21t^{-4}$

$g'(0.5) = \frac{-21}{(0.5)^4} = \boxed{-336}$

a. $g'(0.5) = 112{,}892$
b. $\boxed{g'(0.5) = -336}$
c. $g'(0.5) = 336$
d. $g'(0.5) = -672$
e. $g'(0.5) = -168$

____ 6. Find all the values of x (if any) where the tangent line to the graph of the given equation is horizontal.

$(m = 0)$

$y = 4x^2 + 13x + 13$

$y' = 8x + 13 = 0$

$8x = -13$

$x = \frac{-13}{8} = \boxed{-1.63}$

a. $x = 6.5$
b. $x = 1.63$
c. ~~$x = -6.5$~~
d. $\boxed{x = -1.63}$
e. $x = 0$

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____ 7. Find the derivative of the function.

$h(x) = x(10 + 7x)$ $= 10x + 7x^2$

$h'(x) = \boxed{10 + 14x}$

a. $17x$
b. $10 + 14x$
c. $14 + x$
d. 7
e. $10x$

____ 8. Calculate $\frac{dy}{dx}$. You need not expand your answer.

product rule

$y = (10x^2 + x)(x - x^2)$

$f = 10x^2 + x$ $g = x - x^2$

$f' = 20x + 1$ $g' = 1 - 2x$

derivative $= f'g + g'f$

a. $(20x + 1)(1 - x) + (x - x^2)(10x^2 + x)$
b. $-40x^2 + 22x + 1$
c. $(20x + 1)(x - x^2) + (1 - 2x)(10x^2 + x)$
d. $(20x + 1)(x - x^2) - (1 - 2x)(10x^2 - x)$
e. $(20x + 1)(1 - x) + (x - 2x^2)(10x^2 + x)$

____ 9. Calculate $\frac{dy}{dx}$. You need not expand your answer.

$y = \left(\frac{x}{3.6} + \frac{3.6}{x}\right)\left(x^2 + 4\right)$ $= \underbrace{\left(\frac{1}{3.6}x + \frac{3.6}{x}\right)}_{f} \cdot \underbrace{\left(x^2 + 4\right)}_{g}$

$f = \boxed{\frac{1}{3.6}x + 3.6x^{-1}}$ $g = \boxed{x^2 + 4}$

$f' = \frac{1}{3.6} - 3.6x^{-2}$ $g' = \boxed{2x}$

$= \boxed{\frac{1}{3.6} - \frac{3.6}{x^2}}$

a. $2x$
b. $2x\left(\frac{1}{3.6} - \frac{3.6}{x^2}\right) + \left(\frac{x}{3.6} + \frac{3.6}{x}\right)\left(x^2 + 4\right)$
c. $2x\left(\frac{1}{3.6} - \frac{3.6}{x^2}\right)$
d. $\left(\frac{1}{3.6} - \frac{3.6}{x^2}\right)\left(x^2 + 4\right) + 2x\left(\frac{x}{3.6} + \frac{3.6}{x}\right)$
e. $\left(\frac{1}{3.6} - \frac{3.6}{x^2}\right)\left(x^2 + 4\right) - 2x\left(\frac{x}{3.6} + \frac{3.6}{x}\right)$

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____ 10. Calculate $\frac{dy}{dx}$.

$y = x^2(2x+3)(5x+5)$

a. $25x^2 + (2x+3)(5x+5)$
b. $40x^3 + 75x^2 + 30x$
c. $65x^2 + (2x+75)(5x+5)$
d. $2x^3 + 75x^2 + 30x$
e. $2x^2 + 75x + 30$

multiply first

$= x^2(10x^2 + 10x + 15x + 15)$

$= x^2(10x^2 + 25x + 15)$

$y = 10x^4 + 25x^3 + 15x^2$

$y' = 10(4)x^{4-1} + 25(3)x^{3-1} + 15(2)x^{2-1}$

$= \boxed{40x^3 + 75x^2 + 30x}$

____ 11. Calculate $\frac{dy}{dx}$.

$y = \underset{f}{\left(\sqrt{x}+4\right)}\underset{g}{\left(\sqrt{x}+\frac{4}{x^2}\right)}$

a. $\frac{1}{\sqrt{x}}\left(\sqrt{x}+\frac{4}{x^2}\right)+\left(\frac{1}{\sqrt{x}}-\frac{8}{x}\right)\left(\sqrt{x}+4\right)$
b. $\frac{1}{2\sqrt{x}}\left(\sqrt{x}+\frac{4}{x^2}\right)+\left(\frac{1}{2\sqrt{x}}+\frac{8}{x^3}\right)\left(\sqrt{x}+4\right)$
c. $\frac{1}{2\sqrt{x}}\left(\sqrt{x}+\frac{4}{x^2}\right)+\left(\frac{1}{2\sqrt{x}}-\frac{8}{x^3}\right)\left(\sqrt{x}+4\right)$
d. $\frac{\sqrt{x}}{2}\left(\sqrt{x}+\frac{4}{x^2}\right)+\left(\frac{\sqrt{x}}{2}-\frac{8}{x^3}\right)\left(\sqrt{x}+4\right)$
e. $\frac{1}{2\sqrt{x}}\left(\sqrt{x}+\frac{4}{x^2}\right)+\left(\frac{1}{2\sqrt{x}}-8x\right)\left(\sqrt{x}+4\right)$

product rule

$f = \sqrt{x} + 4$

$= x^{1/2} + 4$

$f' = \frac{1}{2}x^{-1/2} + 0$

$g = \sqrt{x} + \frac{4}{x^2}$

$= x^{1/2} + 4x^{-2}$

$g' = \frac{1}{2}x^{-1/2} - 8x^{-3}$

$f'g + g'f$

$= \left(\frac{1}{2}x^{-1/2}\right)\left(x^{1/2}+4x^{-2}\right) + \left(x^{1/2}+4\right)\left(\frac{1}{2}x^{-1/2} - 8x^{-3}\right)$

$= \left(\frac{1}{2}\cdot\frac{1}{\sqrt{x}}\right)\left(\sqrt{x}+\frac{4}{x^2}\right) + \left(\sqrt{x}+4\right)\left(\frac{1}{2\sqrt{x}} - \frac{8}{x^3}\right)$

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____ 12. Calculate $\frac{dy}{dx}$. You need not expand your answer.

$$y = \frac{5x+5}{4x-1}$$

a. $\frac{5(4x-1)+4(5x+5)}{(4x-1)^2}$

b. $\frac{5(4x-1)-4(5x+5)}{(4x-1)^2}$

c. $\frac{5(4x-1)+4(5x+5)}{4x-1}$

d. $5(4x-1)-4(5x+5)$

e. 1.25

Quotient Rule

$f = 5x+5$ $g = 4x-1$

$f' = 5$ $g' = 4$

$$\frac{f'g - g'f}{g^2}$$

$$= \boxed{\frac{5(4x-1) - 4(5x+5)}{(4x-1)^2}}$$

____ 13. Calculate $\frac{dy}{dx}$. You need not expand your answer.

$$y = \frac{2x-3}{(x-5)(x-1)(x-4)}$$

a. $\frac{2(x-5)(x-1)(x-4)+(3x^2-20x+10)(2x-3)}{((x-5)(x-1)(x-4))^2}$

b. $\frac{2}{3x^2-20x+10}$

c. $\frac{2(x-5)(x-1)(x-4)-(3x^2-20x+10)(2x-3)}{(x-5)(x-1)(x-4)}$

d. $\frac{2(x-5)(x-1)(x-4)-(3x^2-20x+29)(2x-3)}{((x-5)(x-1)(x-4))^2}$

e. $\frac{2(x-5)(x-4)-(3x^2-20x+29)}{((x-5)(x-4))^2}$

$$y' = \frac{f'g - g'f}{g^2}$$

$f = 2x - 3$ $g = (x-5)(x-1)(x-4)$

triple product rule

$f' = 2$ $g' = (1)(x-1)(x-4) + (x-5)(1)(x-4) + (x-5)(x-1)(1)$

$$\boxed{y' = \frac{2(x-5)(x-1)(x-4) - (2x-3)\left[(x-1)(x-4) + (x-5)(x-4) + (x-5)(x-1)\right]}{((x-5)(x-1)(x-4))^2}}$$

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____ 14. Compute the derivative.

$$\frac{d}{dx}\left[(x^3+3x)(x^2-x)\right]\Bigg|_{x=2}$$

a. 92
b. 36
c. 59
d. 72
e. 78

$(x^3+3x)(x^2-x)$

$= x^5 - x^4 + 3x^3 - 3x^2$

$\frac{d}{dx}(x^5-x^4+3x^3-3x^2)$

$= 5x^4 - 4x^3 + 9x^2 - 6x \Big|_{x=2}$

$= 5(2)^4 - 4(2)^3 + 9(2)^2 - 6(2)$

$= \boxed{72}$

____ 15. Calculate the derivative of the function.

$g(x) = (2x^2+2x+3)^{-3}$

a. $g'(x) = -3(4x+2)(2x^2+2x+3)^{-4}$
b. $g'(x) = (-6x^2+6x+9)^{-4}$
c. $g'(x) = -3(4x+2)(2x^2+2x+3)$
d. $g'(x) = -3(2x^2+2x+3)^{-4}$
e. $g'(x) = -12(2x^2+2x+3)^{-4}$

$g(x) = (2x^2+2x+3)^{-3}$

$g'(x) = -3($

____ 16. Calculate the derivative of the function.

$$s(x) = \left(\frac{6x+7}{5x-2}\right)^5 = (6x+7)^5(5x-2)^{-5}$$

a. $s'(x) = \left(\frac{6x+7}{5x-2}\right)^4 \frac{47}{(5x-2)^2}$

b. $s'(x) = -5\left(\frac{6x+7}{5x-2}\right)^4 \frac{12}{(5x-2)^2}$

c. $s'(x) = -5\left(\frac{6x+7}{5x-2}\right)^4 \frac{47x}{(5x-2)^2}$

d. $s'(x) = 5\left(\frac{6x+7}{5x-2}\right)^4$

e. $s'(x) = -5\left(\frac{6x+7}{5x-2}\right)^4 \frac{47}{(5x-2)^2}$

$f = (6x+7)^5$

$f' = 5(6x+7)^4(6)$

$= 30(6x+7)^4$

$g = (5x-2)^{-5}$

$g' = -5(5x-2)^{-6} \cdot 5$

$= -25(5x-2)^{-6}$

$s'(x) = 30(6x+7)^4(5x-2)^{-5} + -25(5x-2)^{-6}(6x+7)^5$

$= -5(6x+7)^4(5x-2)^{-6}\underbrace{\left[-6(5x-2)+5(6x+7)\right]}_{-\cancel{30x}+12+\cancel{30x}+35}$

$= \boxed{\frac{-5(6x+7)^4}{(5x-2)^6} \cdot 47}$

____ 17. Find the indicated derivative. The independent variable is a function of t.

$y = x^{0.5}(1+x); \frac{dy}{dt} = ?$ $= x^{0.5} + x^{1.5}$

This is a type of implicit differentiation

a. $\frac{dy}{dt} = (1.5x^{0.5})\frac{dx}{dt}$

b. $\frac{dy}{dt} = (0.5x^{-0.5})\frac{dx}{dt}$

c. $\frac{dy}{dt} = (0.5x^{-0.5} + 2.5x^{0.5})\frac{dx}{dt}$

d. $\frac{dy}{dt} = (0.5x^{-0.5} + 1.5x^{0.5})\frac{dx}{dt}$

e. $\frac{dy}{dt} = (0.5x^{0.5} + 2.5x^{0.5})\frac{dx}{dt}$

$\frac{dy}{dt} = 0.5x^{-0.5}\frac{dx}{dt} + 1.5x^{0.5}\frac{dx}{dt}$

$= \left[0.5x^{-0.5} + 1.5x^{0.5}\right]\frac{dx}{dt}$

____ 18. Find the indicated derivative.

$y = 8x^3 + \frac{11}{x}, x = 5$ when $t = 1, \left.\frac{dx}{dt}\right|_{t=1} = 11; \left.\frac{dy}{dt}\right|_{t=1} = ?$

Please round the answer to the nearest hundredth.

a. $\left.\frac{dy}{dt}\right|_{t=1} = 2175.80$

b. $\left.\frac{dy}{dt}\right|_{t=1} = 599.56$

c. $\left.\frac{dy}{dt}\right|_{t=1} = 1315.16$

d. $\left.\frac{dy}{dt}\right|_{t=1} = 6595.16$

e. $\left.\frac{dy}{dt}\right|_{t=1} = 13151.60$

$y = 8x^3 + 11x^{-1}$

$\frac{dy}{dt} = 24x^2\frac{dx}{dt} + -11x^{-2}\frac{dx}{dt}$

$\frac{dy}{dt} = 24(5)^2(11) + -11(5)^{-2}(11)$

$\boxed{\frac{dy}{dt} = 6595.16}$

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____ 19. Find the derivative of the following function.

$f(x) = \ln(5x - 9)$

a. $\dfrac{1}{5x-9}$

b. $\boxed{\dfrac{5}{5x-9}}$

c. $\dfrac{9}{5x-9}$

d. $\dfrac{45}{5x-9}$

e. none of these

$$f(x) = \ln(5x-9)$$
$$f'(x) = \frac{1}{5x-9} \cdot \underbrace{\frac{d}{dx}(5x-9)}_{5}$$
$$= \boxed{\frac{5}{5x-9}}$$

____ 20. Find the derivative of the following function.

$f(x) = \log_7 4x$

a. $\dfrac{1}{4x\ln(7)}$

b. $\dfrac{7}{x\ln(4)}$

c. $\boxed{\dfrac{1}{x\ln(7)}}$

d. $\dfrac{4}{x\ln(7)}$

e. none of these

$$f(x) = \log_a x$$
$$f'(x) = \frac{1}{x\ln a}$$

$$\log_7 4x = f(x)$$
$$f'(x) = \frac{1}{4x \cdot \ln 7} \cdot 4$$
chain
$$= \boxed{\frac{1}{x\ln 7}}$$

____ 21. Find the derivative of the function.

$f(x) = (x^9 + 8)\ln x$

a. $\dfrac{x^9(9 + 9\ln x) + 8}{x}$

b. $\dfrac{x^8(1 + 9\ln x) + 8}{x}$

c. $\boxed{\dfrac{x^9(1 + 9\ln x) + 8}{x}}$

d. $\dfrac{x^9(1 + \ln x) + 8}{x}$

e. none of these

$\boxed{\text{product}}$

$$f = x^9 + 8 \qquad g = \ln x$$
$$f' = 9x^8 \qquad g' = \frac{1}{x}$$

$$= 9x^8(\ln x) + \frac{1}{x}(x^9 + 8)$$
$$= 9x^8 \cdot \ln x + x^8 + \frac{8}{x}$$
$$= \frac{9x^9 \ln x}{x} + \frac{x^9}{x} + \frac{8}{x}$$
$$= \boxed{\frac{x^9(\ln x + 1) + 8}{x}}$$

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____ 22. Find the derivative of the function.

$h(x) = \ln\left[(-2x+2)(7x+5)\right]$ $= \ln(-2x+2) + \ln(7x+5)$

a. $\dfrac{7}{(-2x+2)} + \dfrac{2}{(7x+5)}$

b. $\dfrac{7}{(-2x+2)} - \dfrac{2}{(7x+5)}$

c. $\dfrac{-2}{(-2x+2)} + \dfrac{7}{(7x+5)}$

d. $\dfrac{1}{(-2x+2)} + \dfrac{1}{(7x+5)}$

e. $\dfrac{1}{(-2x+2)} - \dfrac{1}{(7x+5)}$

$h'(x) = \dfrac{1}{-2x+2} \cdot -2 + \dfrac{1}{7x+5} \cdot 7$

$= \boxed{\dfrac{-2}{-2x+2} + \dfrac{7}{7x+5}}$

____ 23. Find the derivative of the function.

$f(x) = \ln\left|\dfrac{(5x+3)^6}{(4x+2)^9(8x+9)}\right|$ $= \ln(5x+3)^6 - \ln(4x+2)^9 - \ln(8x+9)$

$= 6\ln(5x+3) - 9\ln(4x+2) - \ln(8x+9)$

a. $\dfrac{30}{5x+3} + \dfrac{36}{4x+2} + \dfrac{8}{8x+9}$

b. $\dfrac{30}{5x+3} - \dfrac{36}{4x+2} - \dfrac{8}{8x+9}$

c. $\dfrac{5}{(5x+3)^6} - \dfrac{4}{(4x+2)^9} - \dfrac{8}{8x+9}$

d. $\dfrac{5}{(5x+3)^6} + \dfrac{4}{(4x+2)^9} + \dfrac{8}{8x+9}$

e. none of these

$f'(x) = 6 \cdot \dfrac{1}{5x+3} \cdot 5 - 9 \cdot \dfrac{1}{4x+2} \cdot 4 - \dfrac{1}{8x+9} \cdot 8$

$= \boxed{\dfrac{30}{5x+3} - \dfrac{36}{4x+2} - \dfrac{8}{8x+9}}$

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____ 24. Find the derivative of the function.

$r(x) = \left[\ln(x^7)\right]^4 = [7 \cdot \ln x]^4$

a. $\dfrac{28[\ln(x^6)]^3}{x^7}$

b. $\dfrac{28[\ln(x^7)]^3}{x^7}$

c. $\boxed{\dfrac{28[\ln(x^7)]^3}{x}}$

d. $\dfrac{28[\ln(x^7)]^4}{x^7}$

e. none of these

$r'(x) = 4 \cdot [7 \ln x]^3 \cdot \frac{d}{dx}(7 \ln x)$

$= 4\underbrace{[7 \ln x]}_{\text{rewrite as } \ln x^7 \text{ again}}^3 \cdot \frac{7}{x}$

$= \boxed{\dfrac{28[\ln x^7]^3}{x}}$

____ 25. Find the derivative of the function.

$f(x) = e^{5x^7} \ln 4x$

Product Rule

a. $\boxed{35e^{5x^7} x^6 \ln 4x + \dfrac{e^{5x^7}}{x}}$

b. $35e^{5x^7} x^6 \ln 4x + \dfrac{e^{5x^7}}{4}$

c. $35e^{5x^6} x^6 \ln 4x + \dfrac{e^{5x^7}}{x}$

d. $35e^{5x^7} x^7 \ln 4x + \dfrac{4e^{5x^7}}{x}$

e. $7e^{5x^7} x^6 \ln 4x + \dfrac{4e^{5x^7}}{x}$

$f = e^{5x^7}$ $g = \ln 4x$

$f' = e^{5x^7} \cdot 35x^6$

$g' = \frac{1}{4x} \cdot 4 = \frac{1}{x}$

$= 35x^6 \cdot e^{5x^7} \cdot \ln 4x + \frac{1}{x} \cdot e^{5x^7}$

$= \boxed{35e^{5x^7} \cdot x^6 \ln 4x + \dfrac{e^{5x^7}}{x}}$

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____ 26. Find the derivative of the function.

$$h(x) = e^{5x^2 - 2x + \frac{1}{x}}$$

a. $\dfrac{10x^2 - 2x - 1}{x} e^{5x^2 - 2x + \frac{1}{x}}$

b. $\dfrac{10x^3 - 2x^2 - 1}{x^2} e^{5x^2 - 2x + \frac{1}{x}}$

c. $\dfrac{5x^3 - 4x^2 - 1}{x} e^{5x^2 - 2x + \frac{1}{x}}$

d. $\dfrac{5x^3 - 4x^2 - 1}{x^2} e^{5x^2 - 2x + \frac{1}{x}}$

e. none of these

x^{-1}

$$h'(x) = e^{5x^2-2x+\frac{1}{x}} \cdot \frac{d}{dx}\left(5x^2 - 2x + \frac{1}{x}\right)$$

$$h'(x) = e^{5x^2-2x+\frac{1}{x}} \cdot 10x - 2 - x^{-2}$$

$$= \left(10x - 2 - \frac{1}{x^2}\right) e^{5x^2-2x+\frac{1}{x}}$$

lcd $= x^2$

$$= \boxed{\frac{10x^3 - 2x^2 - 1}{x^3} e^{5x^2-2x+\frac{1}{x}}}$$

____ 27. Find the derivative of the function.

$$\frac{e^{-10x}}{10xe^{10x}} = \text{Algebra first!} = \frac{1}{10xe^{20x}} = \frac{e^{-20x}}{10x} \qquad \frac{f}{g}$$

Quotient Rule

a. $-\dfrac{20x - 1}{10x^2 e^{20x}}$

b. $-\dfrac{20x + 1}{x^2 e^{20x}}$

c. $\dfrac{20x + 1}{10x^2 e^{20x}}$

d. $-\dfrac{20x + 1}{10x^2 e^{20x}}$

e. none of these

$f = e^{-20x}$ $\quad g = 10x$

$f' = -20e^{-20x}$ $\quad g' = 10$

$$= \frac{-200xe^{-20x} - 10e^{-20x}}{(10x)^2}$$

$$= \frac{-\cancel{10}e^{-20x}[20x + 1]}{10\,\cancel{100}x^2}$$

$$= \boxed{-\frac{20x + 1}{10x^2 e^{20x}}}$$

____ 28. Find $\dfrac{dy}{dx}$ using implicit differentiation.

$3x + 4y = 10$

a. $-\dfrac{4}{3}$

b. -3

c. $-\dfrac{3}{4}$

d. 0

e. -4

$3 + 4y' = 0$

$4y' = -3$

$\boxed{y' = \dfrac{-3}{4}}$

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____ 29. Find $\frac{dy}{dx}$ using implicit differentiation.

$7x + 5y = xy$

a. $\frac{x-5}{7-y}$
b. $\boxed{\frac{7-y}{x-5}}$
c. $5-y$
d. $x-7$
e. $\frac{7-x}{y-5}$

$7x + 5y = \underbrace{xy}_{\text{product}}$

$f = x \quad g = y$

$f' = 1 \quad g' = y'$

$y + xy'$

$7 + 5y' = y + xy'$

$5y' - xy' = y - 7$

$y'(5 - x) = y - 7$

$y' = \frac{y-7}{5-x} = \boxed{\frac{7-y}{x-5}}$

____ 30. Find $\frac{dy}{dx}$ using implicit differentiation.

$y\ln x + y = 10$

a. $\boxed{-\frac{y}{x(\ln x + 1)}}$
b. $-\frac{x}{y(\ln y + 1)}$
c. $\frac{y}{x\ln x}$
d. $-\frac{1}{x(\ln x + 1)}$
e. $\frac{y}{x(\ln x + 1)}$

$\underbrace{y\ln x}_{\text{product}} + y = 10$

$f = y \quad g = \ln x$

$f' = y' \quad g' = \frac{1}{x}$

$y'\ln x + \frac{y}{x}$

$y'\ln x + \frac{y}{x} + y' = 0$

$y'\ln x + y' = -\frac{y}{x}$

$y'(\ln x + 1) = \frac{-y}{x}$

$\boxed{y' = \frac{-y}{x(\ln x + 1)}}$

Name: ______________________ ID: A

____ 31. Find $\frac{dy}{dx}$ using implicit differentiation.

$\frac{xy}{8} - y^2 = 5$

a. $\frac{1}{\sqrt{16xy}}$

b. $\frac{y}{16x - y}$

c. $16y - 8x$

d. $\frac{1}{8y - x}$

e. $\boxed{\frac{y}{16y - x}}$

$$\underbrace{\frac{1}{8}xy}_{\text{product}} - y^2 = 5$$

$$f = \frac{1}{8}x \quad g = y$$

$$f' = \frac{1}{8} \quad g' = y'$$

$$\frac{1}{8}y + \frac{1}{8}xy' - 2y \cdot y' = 0$$

$$\frac{1}{8}xy' - 2y \cdot y' = -\frac{1}{8}y$$

multiply by 8

$$xy' - 16y \cdot y' = -y$$

$$y'(x - 16y) = -y$$

$$y' = \frac{-y}{x - 16y} = \boxed{\frac{y}{16y - x}}$$

____ 32. Find $\frac{dx}{dy}$ using implicit differentiation.

$(xy)^2 + y^2 = 3$

a. ~~$2y + 2x$~~

b. $\boxed{\cancel{-\frac{(x^2+1)}{xy}}}$

c. ~~$-\frac{x}{y}$~~

d. $\frac{xy}{x^2+1}$

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

$$\left.\begin{aligned} (xy)^2 + y^2 &= 3 \\ x^2y^2 + y^2 &= 3 \\ y^2(x^2+1) &= 3 \end{aligned}\right\} \text{algebra}$$

$$f = y^2 \quad g = x^2 + 1 \quad \text{product Rule}$$

$$f' = 2y \cdot y' \quad g' = 2x$$

Answer is not among the choices!

$$2y \cdot y'(x^2+1) + 2xy^2 = 0$$

$$2yy'(x^2+1) = -2xy^2$$

$$y' = \frac{-2xy^2}{2y(x^2+1)} = \boxed{\frac{-xy}{x^2+1}}$$

Name: ____________________ **ID: A**

____ 33. Find $\frac{dy}{dx}$ using implicit differentiation.

$xe^y - ye^x = 10$

a. $\frac{y-1}{x-1}$

b. $\frac{xe^x + e^y}{ye^y + e^x}$

c. $\frac{xe^y - e^x}{ye^x - e^y}$

d. $\boxed{\frac{ye^x - e^y}{xe^y - e^x}}$

e. $\frac{ye^y + e^x}{xe^y - e^x}$

xe^y

$f = x \quad g = e^y$

$f' = 1 \quad g' = e^y \cdot y'$

$e^y + x \cdot e^y \cdot y'$

ye^x

$f = y \quad g = e^x$

$f' = y' \quad g' = e^x$

$y'e^x + e^x \cdot y$

$e^y + xe^y \cdot y' - y'e^x - e^x y = 0$

$xe^y \cdot y' - y'e^x = e^x y - e^y$

$y'(xe^y - e^x) = e^x y - e^y$

$\boxed{y' = \frac{y \cdot e^x - e^y}{x \cdot e^y - e^x}}$

____ 34. Find $\frac{dy}{dx}$ using implicit differentiation.

$\frac{e^x}{y^2} = 12 + e^y$

a. $\frac{y}{2+y^3}$

b. $\boxed{\frac{ye^x}{2e^x + y^3 e^y}}$

c. $\frac{2e^x + y^3 e^y}{ye^x}$

d. $\frac{ye^x}{12e^x + 3y^2 e^y}$

e. $\frac{2ye^x}{e^x + ye^y}$

$e^x \cdot y^{-2}$

$f = e^x \quad g = y^{-2}$

$f' = e^x \quad g' = -2y^{-3} \cdot y'$

$e^x \cdot y^{-2} + e^x(-2y^{-3})y'$

$e^x y^{-2} + e^x(-2y^{-3})y' = 0 + e^y \cdot y'$

$e^x(-2y^{-3})y' - e^y \cdot y' = -e^x y^{-2}$

$y'\left(\frac{-2}{y^3}e^x - e^y\right) = \frac{-e^x}{y^2}$

multiply by $-y^3$

$y'(+2e^x + y^3 e^y) = +e^x \cdot y$

$\boxed{y' = \frac{e^x y}{2e^x + y^3 e^y}}$

Name: ____________________ ID: A

____ 35. Find $\frac{dy}{dx}$ using implicit differentiation.

$\ln(20 + e^{xy}) = y$

a. $x + y$

b. $\dfrac{1}{20 + e^{xy}(1 - x)}$

c. $\dfrac{ye^{xy}}{20 + e^{xy}}$

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

e. $\boxed{\dfrac{ye^{xy}}{20 + e^{xy}(1 - x)}}$

$$\frac{1}{20+e^{xy}} \cdot \underbrace{\frac{d}{dx}(20+e^{xy})} = y'$$

$f = x \quad g = y$

$f' = 1 \quad g' = y'$

$y + xy'$

$$\frac{1}{20+e^{xy}} \cdot e^{xy} \cdot (y + xy') = y'$$

$$e^{xy}(y + xy') = y'(20 + e^{xy})$$

$$ye^{xy} + xy'e^{xy} = y'(20) + y'e^{xy}$$

____ 36. Use the shortcut rules to calculate the derivative of the given function.

$f(x) = 8x^{2.5}$

a. $f(x) = 20x$

b. $f(x) = 8x^{2.5}$

c. $\boxed{f(x) = 20x^{1.5}}$

d. $f(x) = 20x^{2.5}$

e. $f(x) = 8x^{1.5}$

$$xy'e^{xy} - y'e^{xy} - y'(20) = -ye^{xy}$$

$$y'(xe^{xy} - e^{xy} - 20) = -ye^{xy}$$

$$y' = \frac{-ye^{xy}}{\underbrace{xe^{xy} - e^{xy} - 20}_{e^{xy}(x-1) - 20}}$$

multiply by $\frac{-1}{-1}$

$$y' = \frac{ye^{xy}}{\underbrace{-xe^{xy} + e^{xy} + 20}_{e^{xy}(1-x) + 20}}$$

$$\boxed{y' = \frac{ye^{xy}}{20 + e^{xy}(1-x)}}$$

Short Answer

37. Find the derivative of the function.

$s(x) = 7\sqrt{x} + \dfrac{35}{\sqrt{x}}$

38. Find the derivative of the function.

$k(x) = \dfrac{6x^8 - 10x^9}{x^3}$

36

$f(x) = 8x^{2.5}$

$f'(x) = 8(2.5)x^{2.5-1}$

$= \boxed{20x^{1.5}}$

39. Given.

$$\lim_{x\to 8} \frac{x^2-16x+64}{x^2-8x}$$

$= \lim_{x\to 8} \frac{x^2-16x+64}{x^2-8} \quad \frac{0}{0}$

$= \lim_{x\to 8} \frac{2x-16}{2x} = \frac{0}{16} = 0$

Say whether L'Hospital's rule applies.

____

$\frac{2(8)-16}{2(8)}$

It is does, use it to evaluate the given limit. If not, use some other method.

____

40. Given.

$$\lim_{x\to -2} \frac{x^2+14x+24}{x^2+2x}$$

$= \lim_{x\to -2} \frac{x^2+14x+24}{x^2+2x} \quad \frac{0}{0}$

$= \lim_{x\to -2} \frac{2x+14}{2x+2}$

$= \frac{2(-2)+14}{2(-2)+2}$

Say whether L'Hospital's rule applies.

____

It is does, use it to evaluate the given limit. If not, use some other method.

$= \frac{10}{-2} = -5$

____

37 $S(x) = 7\sqrt{x} + \frac{35}{\sqrt{x}} = 7x^{1/2} + 35x^{-1/2}$

$S'(x) = 7\left(\frac{1}{2}\right)x^{-1/2} + 35\left(-\frac{1}{2}\right)x^{-3/2}$

$= \boxed{\frac{7}{2}\cdot\frac{1}{\sqrt{x}} - \frac{35}{2}\cdot\frac{1}{x^{3/2}}}$

38 $K(x) = \frac{6x^8-10x^9}{x^3} = \frac{6x^8}{x^3} - \frac{10x^9}{x^3} = 6x^5 - 10x^6$

$\boxed{K'(x) = 30x^4 - 60x^5}$

MAC 2233 Chapter 4 Review for the test
Answer Section

MULTIPLE CHOICE

1.	ANS: E	PTS: 1
2.	ANS: E	PTS: 1
3.	ANS: D	PTS: 1
4.	ANS: A	PTS: 1
5.	ANS: B	PTS: 1
6.	ANS: D	PTS: 1
7.	ANS: B	PTS: 1
8.	ANS: C	PTS: 1
9.	ANS: D	PTS: 1
10.	ANS: B	PTS: 1
11.	ANS: C	PTS: 1
12.	ANS: B	PTS: 1
13.	ANS: D	PTS: 1
14.	ANS: D	PTS: 1
15.	ANS: A	PTS: 1
16.	ANS: E	PTS: 1
17.	ANS: D	PTS: 1
18.	ANS: D	PTS: 1
19.	ANS: B	PTS: 1
20.	ANS: C	PTS: 1
21.	ANS: C	PTS: 1
22.	ANS: C	PTS: 1
23.	ANS: B	PTS: 1
24.	ANS: C	PTS: 1
25.	ANS: A	PTS: 1
26.	ANS: B	PTS: 1
27.	ANS: D	PTS: 1
28.	ANS: C	PTS: 1
29.	ANS: B	PTS: 1
30.	ANS: A	PTS: 1
31.	ANS: E	PTS: 1
32.	ANS: B	PTS: 1
33.	ANS: D	PTS: 1
34.	ANS: B	PTS: 1
35.	ANS: E	PTS: 1
36.	ANS: C	PTS: 1

SHORT ANSWER

37. ANS:
$\dfrac{3.5}{\sqrt{x}} - \dfrac{17.5}{x^{1.5}}$

PTS: 1

38. ANS:
$30x^4 - 60x^5$

PTS: 1

39. ANS:
yes; 0

PTS: 1

40. ANS:
yes; -5

PTS: 1