Calculus

Name_____ ID: 1

Unit 3 Skills Practice

Date_____ Period____

Differentiate each function with respect to x.

1) $y = (5x^3 - 3)^4(3x + 5)$

2) $y = \dfrac{4x^2 + 3}{(2x^4 + 1)^4}$

3) $y = (2x^2 + 5)^{\frac{1}{5}}$

4) $y = (-x^5 + 3)^{-5}$

5) $y = \sqrt[5]{3x^5 + 5}$

6) $y = \sqrt{5x^2 - 1}$

7) $y = \left(\sqrt[5]{-5x^5 + 1} - 2\right)^3$

8) $y = \left((3x - 1)^5 - 2\right)^3$

9) $y = e^{2x^4}$

10) $y = e^{2x^2}$

11) $y = e^{5x^2}(2x^3 + 3)$

12) $y = e^{e^{4x^5}}$

13) $y = \ln 5x^2$

14) $y = \ln 4x^5$

15) $y = \ln x^4$

16) $y = \ln x^5$

17) $y = \ln \left(\dfrac{x^2}{3x^5 + 5} \right)^3$

18) $y = \ln \left(\dfrac{3x^3}{2x^5 + 3} \right)^3$

19) $y = \tan^{-1} 5x^4$

20) $y = \sec^{-1} -3x^5$

21) $y = \sec^{-1} -5x^3$

22) $y = \tan^{-1} 2x^2$

For each problem, you are given a table containing some values of differentiable functions $f(x)$, $g(x)$ and their derivatives. Use the table data and the rules of differentiation to solve each problem.

23)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	2	1	4	−1
2	3	1	3	−1
3	4	$-\dfrac{1}{2}$	2	−1
4	2	−2	1	−1

Part 1) Given $h_1(x) = f(x) + g(x)$, find $h_1'(3)$

Part 2) Given $h_2(x) = f(x) - g(x)$, find $h_2'(3)$

Part 3) Given $h_3(x) = f(x) \cdot g(x)$, find $h_3'(2)$

Part 4) Given $h_4(x) = \dfrac{f(x)}{g(x)}$, find $h_4'(4)$

Part 5) Given $h_5(x) = (f(x))^2$, find $h_5'(1)$

Part 6) Given $h_6(x) = f(g(x))$, find $h_6'(1)$

Answers to Unit 3 Skills Practice (ID: 1)

1) $\dfrac{dy}{dx} = (5x^3 - 3)^4 \cdot 3 + (3x + 5) \cdot 4(5x^3 - 3)^3 \cdot 15x^2$

2) $\dfrac{dy}{dx} = \dfrac{(2x^4 + 1)^4 \cdot 8x - (4x^2 + 3) \cdot 4(2x^4 + 1)^3 \cdot 8x^3}{\left((2x^4 + 1)^4\right)^2}$

3) $\dfrac{dy}{dx} = \dfrac{1}{5}(2x^2 + 5)^{-\frac{4}{5}} \cdot 4x$

4) $\dfrac{dy}{dx} = -5(-x^5 + 3)^{-6} \cdot -5x^4$

5) $\dfrac{dy}{dx} = \dfrac{1}{5}(3x^5 + 5)^{-\frac{4}{5}} \cdot 15x^4$

6) $\dfrac{dy}{dx} = \dfrac{1}{2}(5x^2 - 1)^{-\frac{1}{2}} \cdot 10x$

7) $\dfrac{dy}{dx} = 3\left((-5x^5 + 1)^{\frac{1}{5}} - 2\right)^2 \cdot \dfrac{1}{5}(-5x^5 + 1)^{-\frac{4}{5}} \cdot -25x^4$

$= -\dfrac{15x^4\left((-5x^5 + 1)^{\frac{1}{5}} - 2\right)^2}{(-5x^5 + 1)^{\frac{4}{5}}}$

8) $\dfrac{dy}{dx} = 3\left((3x - 1)^5 - 2\right)^2 \cdot 5(3x - 1)^4 \cdot 3$

$= 45\left((3x - 1)^5 - 2\right)^2 \cdot (3x - 1)^4$

9) $\dfrac{dy}{dx} = e^{2x^4} \cdot 8x^3$

10) $\dfrac{dy}{dx} = e^{2x^2} \cdot 4x$

11) $\dfrac{dy}{dx} = e^{5x^2} \cdot 6x^2 + (2x^3 + 3) \cdot e^{5x^2} \cdot 10x$

12) $\dfrac{dy}{dx} = e^{e^{4x^5}} \cdot e^{4x^5} \cdot 20x^4$

13) $\dfrac{dy}{dx} = \dfrac{1}{5x^2} \cdot 10x$

14) $\dfrac{dy}{dx} = \dfrac{1}{4x^5} \cdot 20x^4$

15) $\dfrac{dy}{dx} = \dfrac{1}{x^4} \cdot 4x^3$

16) $\dfrac{dy}{dx} = \dfrac{1}{x^5} \cdot 5x^4$

17) $\dfrac{dy}{dx} = 3\left(\dfrac{1}{x^2} \cdot 2x - \dfrac{1}{3x^5 + 5} \cdot 15x^4\right)$

18) $\dfrac{dy}{dx} = 3\left(\dfrac{1}{3x^3} \cdot 9x^2 - \dfrac{1}{2x^5 + 3} \cdot 10x^4\right)$

19) $\dfrac{dy}{dx} = \dfrac{1}{(5x^4)^2 + 1} \cdot 20x^3$

20) $\dfrac{dy}{dx} = \dfrac{1}{\left|-3x^5\right|\sqrt{(-3x^5)^2 - 1}} \cdot -15x^4$

21) $\dfrac{dy}{dx} = \dfrac{1}{\left|-5x^3\right|\sqrt{(-5x^3)^2 - 1}} \cdot -15x^2$

22) $\dfrac{dy}{dx} = \dfrac{1}{(2x^2)^2 + 1} \cdot 4x$

23) $h_1{}'(3) = -\dfrac{3}{2}$

$h_2{}'(3) = \dfrac{1}{2}$

$h_3{}'(2) = 0$

$h_4{}'(4) = 0$

$h_5{}'(1) = 4$

$h_6{}'(1) = 2$