Mrs. Liu's Calculus December 2013 Name_____

Review Packet for ch3.1-3

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For each problem, find the average rate of change of the function over the given interval.

1) $y = -\frac{1}{x+1}$; $[0, \frac{1}{2}]$

2) $y = \frac{1}{x-1}$; $[-1, -\frac{1}{2}]$

3) $y = \frac{1}{x-3}$; $[-2, -\frac{3}{2}]$

4) $y = \frac{1}{x-3}$; $[0, \frac{1}{2}]$

Use the definition of the derivative to find the derivative of each function with respect to *x*.

5) $y = 4x^2 - 5$

6) $y = -5x^2 + 1$

7) $y = x^2 + 2$

8) $y = 2x^2 - 3$

For each problem, find the equation of the tangent line to the function at the given point.

9) $y = 2x^2 + 1$; $(1, 3)$

10) $y = 2x^2 + 1$; $(-1, 3)$

11) $y = x^2 + x - 2$; $(-1, -2)$

12) $y = 2x^2 + 1$; $(0, 1)$

Differentiate each function with respect to *x*.

13) $y = -\frac{1}{3}x - 5x^{-2}$

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

15) $y = -5x^{-2} + \frac{2}{5}x^{-4}$

16) $y = -2x^{-1} - 3x^{-4}$

For each problem, find the indicated derivative with respect to *x*.

17) $y = -2x^2$ Find $\frac{d^2y}{dx^2}$

18) $y = -4x^4$ Find $\frac{d^2y}{dx^2}$

19) $y = x$ Find $\frac{d^2y}{dx^2}$

20) $y = 5x$ Find $\frac{d^2y}{dx^2}$

21) $y = 5x^5 + 3x^3$ Find $\frac{d^3y}{dx^3}$

22) $y = -5x^4 - 2x^2$ Find $\frac{d^3y}{dx^3}$

23) $y = 3x^2 - 5x$ Find $\frac{d^3y}{dx^3}$

24) $y = x^4 - x^2$ Find $\frac{d^3y}{dx^3}$

Differentiate each function with respect to *x*.

25) $y = (-5x^4 - 2)(-3x^3 + 1)$

26) $y = (5x^4 + 5)(-2x^2 + 3)$

27) $y = (-4x^5 + 5)(-3x^2 + 1)$

28) $y = (-5x^4 + 2)(-3x^5 + 2)$

29) $y = \dfrac{3x^2 + 4}{4x^3 - 2}$

30) $y = \dfrac{3x^4 - x^2}{2x^2 + 2}$

31) $y = \dfrac{x^3 - 2}{3x^3 - 3}$

32) $y = \dfrac{4x^5 + 3x^2}{5x^3 - 4}$

33) $y = \sec x^3$

34) $y = \csc 5x^5$

35) $y = \cos 3x^2$

36) $y = \sin 2x^4$

For each problem, find the equation of the line tangent to the function at the given point. Your answer should be in slope-intercept form.

37) $y = (x - 1)^{\frac{2}{3}}$ at $(2, 1)$

38) $y = (-x + 1)^{\frac{1}{2}}$ at $(0, 1)$

39) $y = -(2x + 2)^{\frac{2}{3}}$ at $(3, -4)$

40) $y = -(x - 1)^{\frac{1}{3}}$ at $(2, -1)$

Answers to Review Packet for ch3.1-3 (ID: 1)

1) $\frac{2}{3}$

2) $-\frac{1}{3}$

3) $-\frac{2}{45}$

4) $-\frac{2}{15}$

5) $\frac{dy}{dx} = 8x$

6) $\frac{dy}{dx} = -10x$

7) $\frac{dy}{dx} = 2x$

8) $\frac{dy}{dx} = 4x$

9) $y = 4x - 1$

10) $y = -4x - 1$

11) $y = -x - 3$

12) $y = 1$

13) $\frac{dy}{dx} = -\frac{1}{3} + \frac{10}{x^3}$

14) $\frac{dy}{dx} = 6x^2 + \frac{1}{3}$

15) $\frac{dy}{dx} = \frac{10}{x^3} - \frac{8}{5x^5}$

16) $\frac{dy}{dx} = \frac{2}{x^2} + \frac{12}{x^5}$

17) $\frac{d^2y}{dx^2} = -4$

18) $\frac{d^2y}{dx^2} = -48x^2$

19) $\frac{d^2y}{dx^2} = 0$

20) $\frac{d^2y}{dx^2} = 0$

21) $\frac{d^3y}{dx^3} = 300x^2 + 18$

22) $\frac{d^3y}{dx^3} = -120x$

23) $\frac{d^3y}{dx^3} = 0$

24) $\frac{d^3y}{dx^3} = 24x$

25) $\frac{dy}{dx} = (-5x^4 - 2) \cdot -9x^2 + (-3x^3 + 1) \cdot -20x^3$
$= 105x^6 - 20x^3 + 18x^2$

26) $\frac{dy}{dx} = (5x^4 + 5) \cdot -4x + (-2x^2 + 3) \cdot 20x^3$
$= -60x^5 + 60x^3 - 20x$

27) $\frac{dy}{dx} = (-4x^5 + 5) \cdot -6x + (-3x^2 + 1) \cdot -20x^4$
$= 84x^6 - 20x^4 - 30x$

28) $\frac{dy}{dx} = (-5x^4 + 2) \cdot -15x^4 + (-3x^5 + 2) \cdot -20x^3$
$= 135x^8 - 30x^4 - 40x^3$

29) $\frac{dy}{dx} = \frac{(4x^3 - 2) \cdot 6x - (3x^2 + 4) \cdot 12x^2}{(4x^3 - 2)^2}$
$= \frac{-3x^4 - 12x^2 - 3x}{4x^6 - 4x^3 + 1}$

30) $\frac{dy}{dx} = \frac{(2x^2 + 2)(12x^3 - 2x) - (3x^4 - x^2) \cdot 4x}{(2x^2 + 2)^2}$
$= \frac{3x^5 + 6x^3 - x}{x^4 + 2x^2 + 1}$

31) $\frac{dy}{dx} = \frac{(3x^3 - 3) \cdot 3x^2 - (x^3 - 2) \cdot 9x^2}{(3x^3 - 3)^2}$
$= \frac{x^2}{x^6 - 2x^3 + 1}$

32) $\frac{dy}{dx} = \frac{(5x^3 - 4)(20x^4 + 6x) - (4x^5 + 3x^2) \cdot 15x^2}{(5x^3 - 4)^2}$
$= \frac{40x^7 - 95x^4 - 24x}{25x^6 - 40x^3 + 16}$

33) $\frac{dy}{dx} = \sec x^3 \cdot \tan x^3 \cdot 3x^2$
$= 3x^2 \sec x^3 \cdot \tan x^3$

34) $\frac{dy}{dx} = -\csc 5x^5 \cot 5x^5 \cdot 25x^4$
$= -25x^4 \csc 5x^5 \cdot \cot 5x^5$

35) $\frac{dy}{dx} = -\sin 3x^2 \cdot 6x$
$= -6x \sin 3x^2$

36) $\frac{dy}{dx} = \cos 2x^4 \cdot 8x^3$
$= 8x^3 \cos 2x^4$

37) $y = \frac{2}{3}x - \frac{1}{3}$

38) $y = -\frac{1}{2}x + 1$

39) $y = -\frac{2}{3}x - 2$

40) $y = -\frac{1}{3}x - \frac{1}{3}$