Math 2413 Instructor: Adnan Said
Chapter 2: Sections 2.1, 2.2, 2.3, 2.4, 2.5, and 2.6

2.1 The Derivative and the Tangent Line Problem

Find the derivative by the limit process.

1) $f(x) = x^2 - 4x.$ 1) _____

Find the equation of the tangent line to the graph of f(x) at the point where x = 1.

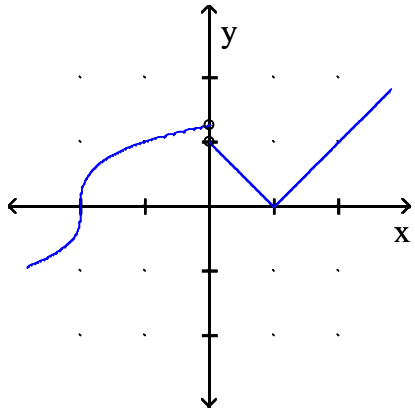
2) $f(x) = x^2 - 4x.$ 2) _____

Use the alternative form of derivative to find the derivative at x = c (if it exists).

3) $f(x) = x^3 + 6x$, $c = 2.$ 3) _____

Find all points where the function whose graph shown do not have derivatives.

4) 4) _____



2.1 Exercises pg 103 **(25, 66, 77)** **(26, 68, 79)**

2.2 Basic Differentiation Rules

Find the derivative.

5) $y = 8x^{-3} + 6x^4 - 2x + 7$ 5) _____

6) $y = 3x^{6/5} - 4x^3 - 10x$ 6) _____

7) $y = \pi \sin x - \frac{5 \cos x}{3}$ 7) _____

Find the following.

8) $f'(4)$ if $f(x) = \frac{6x - 4}{\sqrt{x}}$ 8) _____

9) $f'(2)$ if $f(x) = \dfrac{2x^7 - 4x^2}{x^4}$ 9) _____

Find the equation of the tangent line to the curve when x has the given value.

10) $f(x) = 3x^{4/3} - 2x^2$ at $x = 8$ 10) _____

Find all values of x (if any) where the tangent line to the graph of the function is horizontal.

11) $y = \sqrt{3}x + 2\cos x \;\; ; \;\; 0 \le x < 2\pi$ 11) _____

2.2 Exercises pg 114
(21, 35, 44, 51, 53, 57, 58) **(23, 37, 45, 52, 56, 61)**

2.3 Product and Quotient Rules and Higher–Order Derivatives

Find the derivative of the function.

12) $f(x) = (6x^3 - x^2)(4x - 3)$ 12) _____

13) $f(x) = (\sqrt{x} - 3)(x^2 + 4)$ 13) _____

Find the derivative of the function.

14) $f(x) = \dfrac{4x - 3}{3x^2 - 2}$ 14) _____

15) $y = \dfrac{\sqrt{x}}{2x^2 - 4}$ 15) _____

Find the derivative of the function.

16) $f(x) = 3x^2 \sin x$ 16) _____

17) $y = \dfrac{\sin x}{\cos x - 1}$ 17) _____

Find the third derivative of the function.

18) $f(x) = 2x^4 - 4x^3 - 3x^2 - 7x + 2.$ 18) _____

19) $f(x) = \dfrac{-16}{\sqrt{x}} + x^3 - 4x + 9$ 19) _____

20) $f(x) = 3 \sin x + 2 \cos x$ 20) _____

2.3 Exercises pg 125
(1, 8, 15, 17, 41, 50, 63, 73, 95, 100)
(5, 11, 33, 39, 48, 51, 65, 75, 97, 101)

2.4 The Chain Rule

Find the derivative of the function.

21) $y = (2x^2 + 3x)^7$ 21) _____

22) $y = -6\sqrt{5x + 6}$ 22) _____

23) $f(x) = \dfrac{-5}{(4x - 3)^4}$ 23) _____

Solve the problem.

24) Find all points on the graph of $f(x) = \sqrt[3]{(x^3 - 8)^2}$ for which $f'(x) = 0$ and those for which $f'(x)$ does not exist. 24) _____

Find the derivative of the function.

25) $f(x) = \tan(4x)$ 25) _____

26) $f(x) = \cos(3x)^2$ 26) _____

27) $f(x) = \sin^3 4x$ 27) _____

Solve the problem.

28) Let $f(x) = 2 \sin x + \cos 2x$. 28) _____
Find the tangent to the graph at the point $(\pi, 1)$.

29) Let $f(x) = 2 \sin x + \cos 2x$. 29) _____
Determine all the values of x in the interval $(0, 2\pi)$ at which the graph of f has a horizontal tangent.

2.4 Exercises pg 136
(9, 20, 49, 56, 65, 76, 85, 91) **(13, 22, 55, 57, 68, 79, 83, 89, 92)**

2.5 Implicit differentiation

Find y'.

30) $y^2 - 5y - x^2 = -4$ 30) _____

31) $xy^2 - 2y = x$ 31) _____

32) $y^4 + x^3 = y^2 + 10x$ 32) _____

33) $4x^2y - \pi \cos y = 5\pi$ 33) _____

Find the equation of the tangent line at the indicated point on the given curve.

34) $y^4 + x^3 = y^2 + 10x$, tangent at (0, 1) 34) _____

35) $4x^2y - \pi \cos y = 5\pi$, tangent at $(1, \pi)$ 35) _____

2.5 Exercises pg 145 (5, 11, 26, 29) (7, 14, 28, 30)

2.6 Related Rates

Solve the problem.

36) A pebble is dropped into a calm pond, causing ripples in the form of concentric circles. The radius r of the outer ripple is increasing at a constant rate of 1.5 foot per second. When the radius is 4 feet, at what rate is the area A of the disturbed water changing? 36) _____

37) Air is being pumped into a spherical balloon at a rate of 4.5 cubic feet per minute. Find the rate of change of the radius when the radius is 2 feet. 37) _____

2.6 Exercises pg 153 (3, 11, 15) [4, 16, 17]