Math 3A Session A

JUNE 2012

MAY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

JULY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
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SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1	2
3	4	5	6	7	8	9
10	11	12	13	14 Flag Day	15	16
17 Father's Day	18	19	20	21	22	23
24	25 Slope of the Tangent Line -- see handout	26 3.1 and 3.3	27 HW # 1 Due Today 3.2 and 3.4	28 HW # 2 Due today give to your TA	29	30

★ MEANS HW ASSIGNMENT

⚠ MEANS QUIZ

TEST #1 covers chap 3 and 4.1, not 3.6

JULY 2012

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 Hw #3 3.1# 3,8,13, 21,25,29,36 3.3 # 1,3,5,10, 13,16,19,27-29 due Tuesday in lecture ★	2 3.4 and 3.5	3 Short quiz ⚠ Slope of tangent lines Lecture 3.5 and 4.1	4 NO CLASS Independence Day	5 Hw # 4 3.2 #1,4,5-12, 17,19,22,23,27, 28 3.4 # 1-6,9,11, 14,17 due today ★	6	7
8	9 4.1 and 4.2 and 4.3(lecture) NO quiz in discussion tomorrow Take - home quiz #2 due ⚠	10 HW#5 3.5# 1-6 4.1 # 1-8** 13,15,16,18, 22,26 due Today Look below for ** ★ Monday July 16	11 Lecture:Tues More 4.1 and 4.2 and 4.3 Lecture WED review , begin 4.4	12 Exam I during your discussion section	13 HW #6 4.2 # 1,3,7,13,15,20, 25,27,30,33,43,45,63,65,69, 73,75 4.3 # 1,3,9,22,37,40,49,51,56,60, 75,77,84,85 4.4 #1,3,5,7,9,17,22,29,32,41,42, 47-53,69-71,73,80,85,86,87	14
15	16 "Take-home" Quiz #2 due today ★ Lecture 4.4, 4.5,4.6	17 HW #6 due today Quiz #3 in discussion 4.2-4.4 Lecture 4.7 and review ★	18 Lecture 5.1-5.3	19 Short(one question) quiz #4 on 4.4	20 Hw #7 4.5# 1,5,13,19,22,29 41,59,60-64,67,71 4.6 #1,5,13, 18,29,33,35,41,47,59,61,65-73 4.7 # 23,28,35-39,47,49	21
22 hw #8 5.1 # 48,49 5.2 #3,5,14,17, 18,20 5.3 # 1,6,9,13,17,21, 27,28,37	23 Lecture: more on 5.1-5.3	24 HW #7 due today ★ lecture 5.4 and 5.5	25 Lecture review and 5.6	26 Exam II during your discussion Section covers 4.2-4.7,5.1-5.2	27	28
29	30	31		Final Exam		

**Draw the graph of each function (1-8)and find the derivative from this graph

Math 3A
HW #1 due Wed June 27

Chapter 1 Questions to Guide Your Review

1. How are the real numbers represented? What are the main categories characterizing the properties of the real number system? What are the primary subsets of the real numbers?
2. How are the rational numbers described in terms of decimal expansions? What are the irrational numbers? Give examples.
3. What are the order properties of the real numbers? How are they used in solving equations?
4. What is a number's absolute value? Give examples? How are $|-a|$, $|ab|$, $|a/b|$, and $|a + b|$ related to $|a|$ and $|b|$?
5. How are absolute values used to describe intervals or unions of intervals? Give examples.
6. How do we identify points in the plane using the Cartesian coordinate system? What is the graph of an equation in the variables x and y?
7. How can you write an equation for a line if you know the coordinates of two points on the line? The line's slope and the coordinates of one point on the line? The line's slope and y-intercept? Give examples.
8. What are the standard equations for lines perpendicular to the coordinate axes?
9. How are the slopes of mutually perpendicular lines related? What about parallel lines? Give examples.
10. When a line is not vertical, what is the relation between its slope and its angle of inclination?
11. How do you find the distance between two points in the coordinate plane?
12. What is the standard equation of a circle with center (h, k) and radius a? What is the unit circle and what is its equation?
13. Describe the steps you would take to graph the circle $x^2 + y^2 + 4x - 6y + 12 = 0$. ← show
14. What inequality describes the points in the coordinate plane that lie inside the circle of radius a centered at the point (h, k)? That lie inside or on the circle? That lie outside the circle? That lie outside or on the circle?
15. If a, b, and c are constants and $a \neq 0$, what can you say about the graph of the equation $y = ax^2 + bx + c$? In particular, how would you go about sketching the curve $y = 2x^2 + 4x$?
16. What is a function? What is its domain? Its range? What is an arrow diagram for a function? Give examples.
17. What is the graph of a real-valued function of a real variable? What is the vertical line test?
18. What is a piecewise-defined function? Give examples.
19. What are the important types of functions frequently encountered in calculus? Give an example of each type.
20. In terms of its graph, what is meant by an increasing function? A decreasing function? Give an example of each.
21. What is an even function? An odd function? What symmetry properties do the graphs of such functions have? What advantage can we take of this? Given an example of a function that is neither even nor odd.
22. What does it mean to say that y is proportional to x? To $x^{3/2}$? What is the geometric interpretation of proportionality? How can this interpretation be used to test a proposed proportionality?
23. If f and g are real-valued functions, how are the domains of $f + g, f - g, fg$, and f/g related to the domains of f and g? Give examples.
24. When is it possible to compose one function with another? Give examples of composites and their values at various points. Does the order in which functions are composed ever matter?
25. How do you change the equation $y = f(x)$ to shift its graph vertically up or down by a factor $k > 0$? Horizontally to the left or right? Give examples.
26. How do you change the equation $y = f(x)$ to compress or stretch the graph by $c > 1$? Reflect the graph across a coordinate axis? Give examples.
27. What is the standard equation of an ellipse with center (h, k)? What is its major axis? Its minor axis? Give examples.
28. What is radian measure? How do you convert from radians to degrees? Degrees to radians?
29. Graph the six basic trigonometric functions. What symmetries do the graphs have?
30. What is a periodic function? Give examples. What are the periods of the six basic trigonometric functions?

Chapter 1 Practice Exercises

Inequalities

In Exercises 1–4, solve the inequalities and show the solution sets on the real line.

1. $7 + 2x \geq 3$
2. $-3x < 10$
3. $\frac{1}{5}(x - 1) < \frac{1}{4}(x - 2)$
4. $\frac{x - 3}{2} \geq -\frac{4 + x}{3}$

Absolute Value

Solve the equations or inequalities in Exercises 5–8.

5. $|x + 1| = 7$
6. $|y - 3| < 4$
7. $\left|1 - \frac{x}{2}\right| > \frac{3}{2}$
8. $\left|\frac{2x + 7}{3}\right| \leq 5$

Coordinates

9. A particle in the plane moved from $A(-2, 5)$ to the y-axis in such a way that Δy equaled $3\Delta x$. What were the particle's new coordinates?
10. **a.** Plot the points $A(8, 1)$, $B(2, 10)$, $C(-4, 6)$, $D(2, -3)$, and $E(14/3, 6)$.
    b. Find the slopes of the lines AB, BC, CD, DA, CE, and BD.
    c. Do any four of the five points A, B, C, D, and E form a parallelogram?
    d. Are any three of the five points collinear? How do you know?
    e. Which of the lines determined by the five points pass through the origin?
11. Do the points $A(6, 4)$, $B(4, -3)$, and $C(-2, 3)$ form an isosceles triangle? A right triangle? How do you know?
12. Find the coordinates of the point on the line $y = 3x + 1$ that is equidistant from $(0, 0)$ and $(-3, 4)$.

Lines

In Exercises 13–24, write an equation for the specified line.

13. through $(1, -6)$ with slope 3
14. through $(-1, 2)$ with slope $-1/2$
15. the vertical line through $(0, -3)$
16. through $(-3, 6)$ and $(1, -2)$
17. the horizontal line through $(0, 2)$
18. through $(3, 3)$ and $(-2, 5)$
19. with slope -3 and y-intercept 3
20. through $(3, 1)$ and parallel to $2x - y = -2$
21. through $(4, -12)$ and parallel to $4x + 3y = 12$
22. through $(-2, -3)$ and perpendicular to $3x - 5y = 1$
23. through $(-1, 2)$ and perpendicular to $(1/2)x + (1/3)y = 1$
24. with x-intercept 3 and y-intercept -5

Functions and Graphs

25. Express the area and circumference of a circle as functions of the circle's radius. Then express the area as a function of the circumference.
26. Express the radius of a sphere as a function of the sphere's surface area. Then express the surface area as a function of the volume.
27. A point P in the first quadrant lies on the parabola $y = x^2$. Express the coordinates of P as functions of the angle of inclination of the line joining P to the origin.
28. A hot-air balloon rising straight up from a level field is tracked by a range finder located 500 ft from the point of liftoff. Express the balloon's height as a function of the angle the line from the range finder to the balloon makes with the ground.

In Exercises 29–32, determine whether the graph of the function is symmetric about the y-axis, the origin, or neither.

29. $y = x^{1/5}$
30. $y = x^{2/5}$
31. $y = x^2 - 2x - 1$
32. $y = e^{-x^2}$

In Exercises 33–40, determine whether the function is even, odd, or neither.

33. $y = x^2 + 1$
34. $y = x^5 - x^3 - x$
35. $y = 1 - \cos x$
36. $y = \sec x \tan x$
37. $y = \frac{x^4 + 1}{x^3 - 2x}$
38. $y = 1 - \sin x$
39. $y = x + \cos x$
40. $y = \sqrt{x^4 - 1}$

In Exercises 41–50, find the **(a)** domain and **(b)** range.

41. $y = |x| - 2$
42. $y = -2 + \sqrt{1 - x}$
43. $y = \sqrt{16 - x^2}$
44. $y = 3^{2-x} + 1$
45. $y = 2e^{-x} - 3$
46. $y = \tan(2x - \pi)$
47. $y = 2\sin(3x + \pi) - 1$
48. $y = x^{2/5}$
49. $y = \ln(x - 3) + 1$
50. $y = -1 + \sqrt[3]{2 - x}$

Piecewise-Defined Functions

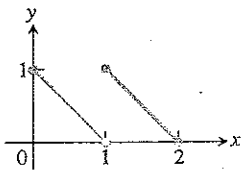
In Exercises 51 and 52, find the **(a)** domain and **(b)** range.

51. $y = \begin{cases} \sqrt{-x}, & -4 \le x \le 0 \\ \sqrt{x}, & 0 < x \le 4 \end{cases}$

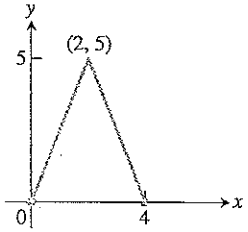
52. $y = \begin{cases} -x - 2, & -2 \le x \le -1 \\ x, & -1 < x \le 1 \\ -x + 2, & 1 < x \le 2 \end{cases}$

In Exercises 53 and 54, write a piecewise formula for the function.

53.



54.



Composition of Functions

In Exercises 55 and 56, find

a. $(f \circ g)(-1)$. **b.** $(g \circ f)(2)$.

c. $(f \circ f)(x)$. **d.** $(g \circ g)(x)$.

55. $f(x) = \frac{1}{x}$, $g(x) = \frac{1}{\sqrt{x + 2}}$

56. $f(x) = 2 - x$, $g(x) = \sqrt[3]{x + 1}$

In Exercises 57 and 58, **(a)** write a formula for $f \circ g$ and $g \circ f$ and find the **(b)** domain and **(c)** range of each.

57. $f(x) = 2 - x^2$, $g(x) = \sqrt{x + 2}$

58. $f(x) = \sqrt{x}$, $g(x) = \sqrt{1 - x}$

Composition with absolute values In Exercises 59–64, graph f_1 and f_2 together. Then describe how applying the absolute value function before applying f_1 affects the graph.

$f_1(x)$	$f_2(x) = f_1(\lvert x\rvert)$
59. x	$\lvert x\rvert$
60. x^3	$\lvert x\rvert^3$
61. x^2	$\lvert x\rvert^2$
62. $\frac{1}{x}$	$\frac{1}{\lvert x\rvert}$
63. $\sqrt{x}$	$\sqrt{\lvert x\rvert}$
64. $\sin x$	$\sin\lvert x\rvert$

Composition with absolute values In Exercises 65–68, graph g_1 and g_2 together. Then describe how taking absolute values after applying g_1 affects the graph.

$g_1(x)$	$g_2(x) = \lvert g_1(x)\rvert$
65. x^3	$\lvert x^3\rvert$
66. $\sqrt{x}$	$\lvert\sqrt{x}\rvert$
67. $4 - x^2$	$\lvert 4 - x^2\rvert$
68. $x^2 + x$	$\lvert x^2 + x\rvert$

Trigonometry

In Exercises 69–72, sketch the graph of the given function. What is the period of the function?

69. $y = \cos 2x$
70. $y = \sin\frac{x}{2}$
71. $y = \sin \pi x$
72. $y = \cos\frac{\pi x}{2}$
73. Sketch the graph $y = 2\cos\left(x - \frac{\pi}{3}\right)$.
74. Sketch the graph $y = 1 + \sin\left(x + \frac{\pi}{4}\right)$.

In Exercises 75–78, ABC is a right triangle with the right angle at C. The sides opposite angles A, B, and C are a, b, and c, respectively.

75. **a.** Find a and b if $c = 2$, $B = \pi/3$.
    b. Find a and c if $b = 2$, $B = \pi/3$.
76. **a.** Express a in terms of A and c.
    b. Express a in terms of A and b.
77. **a.** Express a in terms of B and b.
    b. Express c in terms of A and a.
78. **a.** Express $\sin A$ in terms of a and c.
    b. Express $\sin A$ in terms of b and c.
79. **Height of a pole** Two wires stretch from the top T of a vertical pole to points B and C on the ground, where C is 10 m closer to the base of the pole than is B. If wire BT makes an angle of 35° with the horizontal and wire CT makes an angle of 50° with the horizontal, how high is the pole?
80. **Height of a weather balloon** Observers at positions A and B 2 km apart simultaneously measure the angle of elevation of a weather balloon to be 40° and 70°, respectively. If the balloon is directly above a point on the line segment between A and B, find the height of the balloon.
81. **a.** Graph the function $f(x) = \sin x + \cos(x/2)$.
    b. What appears to be the period of this function?
    c. Confirm your finding in part (b) algebraically.
82. **a.** Graph $f(x) = \sin(1/x)$.
    b. What are the domain and range of f?
    c. Is f periodic? Give reasons for your answer.

Math 3A
HW #2

Read
The slope of the Tangent line

11.6 a, c

11.9 11.10

11.13

due Thurs June 28

Do not use "derivatives"

We have not defined this yet