Senior Analysis Semester 1 Review

LINES

- 1. Give the equations of the lines described.
- a) The vertical line through the point (2, -3).
- b) f(x) is a linear function. f(-2) = 5 and f(4) = 7.
- c) The line through the point (3, 7) parallel to 2x + y = 5.
- d) The line perpendicular to 3x 2y = 6 through the origin.
- 2. Graph the following lines.
- a) y = 2x 3
- b) y = -2
- c) 3y 9x = 18

3. Points A(2, 5) and B(4, -1) form a line segment. Find the equation of the perpendicular bisector of AB.

4. Find the point of intersection of the following system in 2 different ways.

$$3x + 6y = 0$$

-5x + 4y = 7

- 5. Use Cramer's Rule to solve the following system.
 - x + y z = -12x + y + z = 62y - z = -1

6. Identify the tables that display a linear relationship.

a)	
~ /	

		b)			c	c)		
х	у		X	у		Х	у	
2	8		-2	1		2	4	
3	12		0	5		3	8	
4	16		3	11		4	16	

7. Student Government has rented a roller skating rink for \$500. They will sell tickets to a roller skating party for \$10 a piece to the student body.

- a) Give a linear function that expresses the net profit as a function of the number of tickets sold.
- b) Graph your linear function over an appropriate domain.
- c) What is the meaning of the x-intercept of your graph.

8. a) Find a linear regression equation that models the following data which describes math test scores as a function of study time.

Study time (hrs)	Test grade (scale of 100)
1	62
2.5	75
3	80
4.5	90
5	96

- b) According to your equation, how long will you have to study to earn an 85?
- c) What grade might you expect after studying for 5.5 hours?
- d) Do you think a linear model for the study time/grade relationship is appropriate? Why or why not?
- 9. Find the distance from the point (-2, 4) to the line y = x 4.
- 10. Triangle ABC is formed by the points A(0, 0), B(2, 5), and C(8, -3).
- a) Find the equation of the median drawn from A.
- b) Find the equation of the altitude drawn from B.
- 11. In Texas-hold-em poker hands, each player is dealt two cards to start.
- a) How many possible two card hands are possible?
- b) How many two card hands contain two Aces?
- c) What is the probability of being dealt two Aces at the start of a Texas-hold-em hand?

12. A subset of a group of six boys and five girls will form a Prom Committee. If 2 boys and 2 girls must be on the committee, how many different committees are possible?

13. At Whattsamatta University, ID codes consist of 3 numbers followed by 3 letters.a) How many different codes are possible if repetition among the numbers and letters is allowed?

b) How many different codes are possible if repetition among the numbers and letters is not allowed?

c) How many different codes contain at least one "A" in them?

14. In how many ways can 8 people split up into 2 teams of 4 each?

15. How many "words" can be formed from the letters in the word PINGRY?

16. Ten students will be assigned tasks for detention. Three will scrape gum off the bottom of desks. Three will clean the cafeteria. Four will babysit the Cassidy and Leef children. How many different ways can the students be assigned these tasks?

17. Simplify

a) $\frac{120!}{119!}$ b) $\frac{(n+1)!}{(n-1)!}$ c) $\frac{4^3}{2^5}$

d)
$$\left(\frac{2}{3}\right)^{0} + \left(\frac{1}{4}\right)^{-1}$$
 e) $\left(x^{2}\right)^{-4}$ f) $\frac{3a^{2}b^{-5}c^{7}}{27ab^{-1}c^{-2}}$
g) $4(2^{x}) + 2^{x+2}$ h) $\left(\frac{a^{2n}b^{n+2}c}{a^{n}b^{2-3n}c^{-n+1}}\right)^{3}$

18. Solve for n.

a)
$$\frac{(n+2)!}{(n+1)!} = 30$$
 b) $\frac{3^{n+1}}{3^{2-n}} = 27$

- 19. Find the following
- a) The middle term of the expansion of $(x + y^3)^{12}$
- b) The 56th term of the expansion of $(2a^2 bc^4)^{56}$
- c) The 39^{th} term of the sequence 12, 9, 6, 3....
- d) The 11th term of the sequence 64, -32, 16, -8.....
- e) The position of the term 302 in the sequence 5, 8, 11...
- f) The first term of a sequence if the 3rd term is -2 and the 70th term is -136. (AP)

g)
$$\sum_{k=1}^{50} 2k - 1$$
 h) $\sum_{k=5}^{15} 2^{k-1}$ i) $\sum_{k=0}^{\infty} 4\left(\frac{1}{2}\right)^{k-2}$

- j) The sum of the multiples of 3 from 7 to 70
- k) "t" if 2t, 6t-3 and 8t + 12 are sequential terms of an AP

1) What change should be made to problem i so that the answer does not exist (i.e. the series diverges)?

20. Find the following limits

a)
$$\lim_{x\to\infty} \frac{x^2 - 3}{5x^2 + 12x}$$

b) $\lim_{x\to\infty} \frac{x - 3}{3x} - \frac{2x + 1}{4 - x}$
c) $\lim_{x\to\infty} \frac{3x^2 + 4}{x - 6} - \frac{6x^2 - 2}{2x - 3}$
d) $\lim_{x\to\infty} \frac{15x^2 - 18}{\sqrt{9x^4 + 1} + \sqrt{x^4 - 2}}$

21. Convert the following to radians: a) 135° b) 420° c) -7200°

22. Convert the following to degrees: a)
$$\frac{\pi}{18}$$
 b) $\frac{3\pi}{45}$ c) $\frac{2\pi}{33}$

23. When angle is Θ is placed in standard position, its terminal side passes through the given point. Find the values for all six trig functions.

- a) (-2, 2) b) (5, -12) c) (0, 7)
- 24. Given the quadrant of ϕ and one of its six trig values, find the other five.
- a) $\sin \phi = \frac{1}{3}$, ϕ in quadrant I b) $\tan \phi = -2$, ϕ in quadrant II c) $\sec \phi = , \frac{7}{5} \tan \phi < 0$

25. Find each of the following:

a) $\sin \frac{\pi}{4}$ b) $\cos \left(-\frac{\pi}{3}\right)$ c) $\sec 210^{\circ}$ d) $\tan \left(-\frac{5\pi}{4}\right)$ e) $\csc 12\pi$ f) $\cot \frac{7\pi}{2}$ g) $\cos 3630^{\circ}$ h) $\sin (-135^{\circ})$ i) $\sin \frac{4\pi}{3}$ j) $\csc \left(-\frac{5\pi}{3}\right)$ k) $\cos \frac{5\pi}{6}$ l) $\sec 12\pi$

26. Find each angle using angle addition/subtraction formulasa) sin 195°b) cos 165°

27. Determine the following
a)
$$1-2\sin^2\frac{\pi}{12}$$
 b) $\frac{1}{2}\sin 15^\circ \cos 15^\circ$
c) $\cos 75^\circ$ d) $\sin\left(\frac{5\pi}{8}\right)$
28. $\cos \alpha = -\frac{4}{5}$ ($\sin \alpha > 0$) and $\sin \beta = \frac{5}{6}$ ($\tan \beta < 0$). Find the following.
a) $\sin(\alpha + \beta)$ b) $\cos(\alpha + \beta)$ c) Quadrant of $\alpha + \beta$
d) $\cos 2\alpha$ e) $\sin 2\alpha$ f) $\cos \frac{\beta}{2}$
g) $\sin \frac{\beta}{2}$

ANSWERS

1. a)
$$x = 2$$
 b) $y = \frac{1}{3}x + \frac{17}{3}$ c) $y = -2x + 13$ d) $y = -\frac{2}{3}x$
2. Use your graphing calculator to check
3. $y = \frac{1}{3}x + 1$ 4. $\left(-1, \frac{1}{2}\right)$ 5. $(1, 1, 3)$
6. a) Linear; $m = 4$ 7. a) $P(x) = 10 - 500$
b) Linear; $m = 2$ b) use your graphing calculator
c) Not linear - slope is not constant. C) The break even point
8. a) $y = 8.2427x + 54.2233$ ($x =$ hours, $y =$ test score)
b) 3.73 hours
c) $P(x) = 10 - 500$
c) The break even point
7. a) $P(x) = 10 - 500$
b) use your graphing calculator
c) The break even point
7. b) $P(x) = 10 - 500$
c) The break even point
7. c) The break even point
7. c) $P(x) = 10 - 500$
b) $P(x) = 10 - 500$
c) $P(x) = 10 - 500$
c

c) 99.6d) ???

9. The equation of the perpendicular is y = -x + 2; therefore, the point of intersection will be (3, -1). Using the distance formula, $d = 5\sqrt{2}$

10. a)
$$y = \frac{1}{5}x$$
 b) $y = \frac{8}{3}x - \frac{1}{3}$
11. a) ${}_{52}C_2 = 1326$ b) ${}_{4}C_2 = 6$ c) $\frac{6}{1326} = .004524$ Not very likely!!
12. ${}_{6}C_2 \cdot {}_{5}C_2 = 150$
13. a) $10 \cdot 10 \cdot 10 \cdot 26 \cdot 26 \cdot 26 = 17,576,000$ b) $10 \cdot 9 \cdot 8 \cdot 26 \cdot 25 \cdot 24 = 11,232,000$
c) No a's - $10 \cdot 10 \cdot 10 \cdot 25 \cdot 25 \cdot 25 = 15,625,000$
d) At least one a - $17,576,000 - 15,625,000 = 1,951,000$
14. ${}_{8}C_4 = 70$
15. $\frac{5!}{2!} = 60$
16. ${}_{10}C_3 \cdot {}_{7}C_3 \cdot {}_{4}C_4 = 4200$
17. a) 120 b) $(n + 1)n$ c) 2 d) 5
c) $\frac{1}{x^8}$ f) $\frac{ac^9}{9b^4}$ g) 2^{x+3} h) $a^{3n}b^{12n}c^{3n}$
18. a) $n = 28$ b) $n = 2$
19. a) $924x^6y^{18}$ b) $-112a^2b^{55}c^{220}$ c) -102 d) $\frac{1}{16}$
c) $n = 100$ f) $a = 2$ g) 2500 h) 32752
i) 32 j) 819 k) $t = 9$ l) make $r > 1$ or $r < -1$
20. a) $\frac{1}{5}$ b) $\frac{7}{3}$ c) $\frac{27}{2}$ d) $\frac{15}{4}$

21. a)
$$\frac{3\pi}{4}$$
 b) $\frac{7\pi}{3}$ c) -40π

22. a) 10° b) 12° c) $\frac{120}{11}$ °

23. a)
$$\sin x = \frac{\sqrt{2}}{2}$$
, $\cos x = -\frac{\sqrt{2}}{2}$, $\tan x = -1$, $\cot x = -1$, $\sec x = -\sqrt{2}$, $\csc x = \sqrt{2}$
b) $\sin x = -\frac{12}{13}$, $\cos x = \frac{5}{13}$, $\tan x = -\frac{12}{5}$, $\cot x = -\frac{5}{12}$, $\sec x = \frac{13}{5}$, $\csc x = -\frac{13}{12}$
c) $\sin x = 1$, $\cos x = 0$, $\tan x =$ dne, $\cot x = 0$, $\sec x =$ dne, $\csc x = 1$

24. Given the quadrant of ϕ and one of its six trig values, find the other five. a) $\sin x = \frac{1}{3}$, $\cos x = \frac{2\sqrt{2}}{3}$, $\tan x = \frac{\sqrt{2}}{4}$, $\cot x = 2\sqrt{2}$, $\sec x = \frac{3\sqrt{2}}{4}$, $\csc x = 3$ b) $\sin x = \frac{2\sqrt{5}}{5}$, $\cos x = -\frac{\sqrt{5}}{5}$, $\tan x = -2$, $\cot x = -\frac{1}{2}$, $\sec x = -\sqrt{5}$, $\csc x = \frac{\sqrt{5}}{2}$ c) $\sin x = -\frac{2\sqrt{6}}{7}$, $\cos x = \frac{5}{7}$, $\tan x = -\frac{2\sqrt{6}}{5}$, $\cot x = -\frac{5\sqrt{6}}{12}$, $\sec x = \frac{7}{5}$, $\csc x = -\frac{7\sqrt{6}}{12}$ 25. a) $\frac{\sqrt{2}}{2}$ b) $\frac{1}{2}$ c) $-\frac{2\sqrt{3}}{3}$ d) -1 f) 0 g) $\frac{\sqrt{3}}{2}$ h) $-\frac{\sqrt{2}}{2}$ e) dne i) $-\frac{\sqrt{3}}{2}$ j) $\frac{2\sqrt{3}}{3}$ k) $-\frac{\sqrt{3}}{2}$ l) 1 26. a) $\frac{-\sqrt{6} + \sqrt{2}}{4}$ b) $\frac{-\sqrt{2} - \sqrt{6}}{4}$ 1 5 <u>a</u> <u>5</u> 12 5

27. a)
$$\frac{\sqrt{3}}{2}$$
 b) $\frac{1}{8}$ c) $\frac{\sqrt{6} - \sqrt{2}}{4}$ (angle addition) $\frac{+\sqrt{2} - \sqrt{3}}{2}$ (half angle)
d) $\frac{+\sqrt{2} + \sqrt{2}}{2}$

28. a)
$$\frac{-3\sqrt{11}-20}{30}$$
 b) $\frac{4\sqrt{11}-15}{30}$ c) QIII d) $\frac{7}{25}$
e) $\frac{-24}{25}$ f) $\frac{+\sqrt{18}-3\sqrt{11}}{6}$ g) $\frac{+\sqrt{18}+3\sqrt{11}}{6}$