PreCalculus Review Sheet for Final \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Name

Study these problems. The final will look very similar, but with at most one-third fewer problems.

**I. Convert from rectangular coordinates to polar coordinates with r > 0 and 0 ≤ θ < 2π**

1. (3 , – 3) 2. (– , –)

**II. Convert from polar coordinates to rectangular coordinates**

3. (6, ) 4. (– 1, )

**III. Convert the equation to polar form (x = r cosθ, y = r sinθ, x2 + y2 = r2) HINT: get r (or r2) on one side of equation**

5. x – y = 6 6. x2 + y2 = 4x + 4y

**IV. Convert the polar equation to rectangular**

7. r = 3 + 3 cos θ 8. r2 = sec 2θ

**V. Write the complex number in polar form r(cosθ + i sinθ) with an angle (argument) between 0 and 2π and r > 0**

9. 1 +  i 10. – 3 – 3i

**VI. Convert the parametric equation to rectangular form**

11. x = t2 ; y = t4 + 1 12. x = sin2 t ; y = cos t

**VII. Express the vector in component form <a,b> (or <a,b,c>) , given the initial point P and the terminal point Q**

13. P(7, – 1) Q( – 2, 6) 14. P(0, 0) Q(– 9, 2) 15. P (4, -5, 13) Q(-6, 5, 2) u = < , > v = < , > w = < , >

**VIII. Using the vectors from section VII, find:**

16. u + v 17. 3u – 5v 18. | w |

19. Find the magnitude and direction of vector v (round θ to hundredths)

**IX. Find the horizontal and vertical components of the following vectors and put the answers in i,j form (answers to tenths)**

20. | q | = 21, θ = 105° 21. | u | = 18, θ = 285°

**X. Given the vectors, find the dot product and the angle between the vectors**

22. u = < – 2, 2 > and v = < – 1, – 1 > 23. **u =** <2, -4, 7> **v =** <8, 2, 5>

Dot product = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ θ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Dot product = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ θ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

24. what can you do to find out if two vectors are perpendicular??

**XI. Find the vector perpendicular to the given vectors listed.**

25). u = <7, 5, 1> v = <3, -2, -1> 26). u = i + j + k v = 3i – 5k

**XII. Using your knowledge of cross-products, find the following.**

27. The area of a parallelogram determined by the vectors: u = <0, -2, 3> and v = <5, -5, 0>

28. The area of triangle (PQR): P(4, 1, 0), Q(0, 0, -1), R(-8, 2, 0)

**XIII. Given the normal vector and a point on a plane, find the equation of the plane.**

29. n = <5, -1, 2> P(0, 2, -3)

**XIV. Spheres**

30. Write an equation of the sphere with a center at (-8, 5, -1) and a radius of 5.

**XV. Word Problems**





31. Two tugboats are pulling on a barge as shown. One pulls with a force

 of 2 x 104 lbs in the direction N 50° E and the other pulls with a force

 of 3.4 x 104 lbs in the direction S 75° E



1. Find the resultant force on the barge as a vector in i,j form
2. Find the magnitude and direction of the resultant force

32. An airplane heads N 60° E at a speed of 600 mi/h relative to the air. A wind begins to blow in the direction of N 30° W at 50 mi/h.

1. Find the velocity of the airplane as a vector in component form
2. Find the true speed and direction of the plane

**XVI. Solve the following systems of equations by hand using either substitution or elimination:**

33. 2x + y = 7 34. x – y + 2z = 2

 x + 2y = 2 3x + y + 5z = 8

 2x – y – 2z = – 7

**XVII. Matrix problems**

35. Find the inverse of the two by two matrix A = 

36. Given the matrices A =  B =  C =  and D = 

Find a. A + B b. CD

**XVIII. Solve the following systems by making accurate graphs**

37. x2 + y2 = 25 38. y < x2 + 2x – 8

 y = 3/4 x y ≥ – x

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**XIX. Solve the systems**

39. Solve the system of equations x2 + y2 = 10 and x2 + 2y2 – 7y = 0

40. A man invests his savings in two accounts, one paying 6% annual interest and the other paying 7% annual interest. He has twice as much invested in the 7% account as in the 6% account and his annual interest income is $1600. How much is invested in each account?

41. Clarisse invests $60,000 in money market accounts at three different banks. Bank A pays 2% interest per year, Bank B pays 2.5% and Bank C pays 3%. She decides to invest twice as much in Bank B as in the other two banks. After one year, Clarisse has earned $1575 in interest. How much did she invest in each bank?

42. In 2.5 hours an airplane travels 600 km against the wind. It takes 50 minutes to travel 300 km with the wind. Find the speed of the wind and the speed of the airplane in still air.

**XX. Given a formula for a sequence, find the first four terms of the sequence**

43. an =  44. an = 5\*1.03(n – 1)

45. an = an-1+ 5 a1 = 3 46. an = –2an-1 – 4 a1 = 21

**XXI. Find the *explicit* formula (an = ???), given the sequence**

47. 4, 6, 9, 13.5, 20.25 … 48. 100, 102, 104, 106, …

**XXII. Find a *recursive* formula(an = ???), given the sequence**

49. 49, 45, 39, 31, 21, … 50. 3, 11, 19, 27, 35, …

**XXIII. Find the sums of the series**

51. 6 + 11 + 16 + 21 + … + 1026 + 1031 52.  53. 1 +  +  +  + …

**XXIV. Write the following in sigma notation (do not evaluate)**

54. 1200 + 600 + 3000 + 150 + 75 + … 0.0732421875 55. 1 + 4 + 9 + 16 + 25 + 36 + … + 15129

**XXV. Binomial Theorem problems**

56. Find the term containing a6 in (a + 3b)10 57. Find the term that does not contain x in 

**XXVI. Various word problems**

58. The second term of a geometric sequence is 10 and the fifth term is 270. Find the tenth term.

59. The fifth term of an arithmetic sequence 120, and the second term is 300. Find the tenth term

60. The first term of an arithmetic sequence is 17 and the common difference is 13. How many terms of this sequence must be added to get a sum of 81252?

61. The sum of the first four terms of a geometric series is 119.25 and the common ratio is 3.5. Find the first term.

62. Find the end amount of an annuity where a person pays $300 a month for 25 years and gets 4% compounded annually.

63. What are the monthly payments on a mortgage of $155,000 at 3.75% interest if the loan is to be repaid in 30 years? 15 years?