PreCalculus Second Semester Review
Chapters P-3(1st Semester)

Solve. Check for extraneous roots.
All but #15 from 1st semester will be non-calculator.

P3 1. $\frac{x-2}{3}-\frac{x+5}{2}=\frac{1}{3}$

2.8 2. $x^3-2x^2+x\geq 0$

(express the answer using interval notation)

P5 3. $\frac{3x}{x+1}+\frac{5}{x-2}=\frac{15}{x^2-x-2}$

2.4 4. $f(x)=x^4+3x^3-3x^2+3x-4$

given that $x = 1$ and $x = -4$

P1 Simplify. Express your answer without negative exponents.

5. $\frac{\left(uv^{-2}\right)^{-3}}{u^{-5}v^2}$

6. $\frac{4a^3b}{a^2b^3}\cdot\frac{3b^2}{2a^2b^4}$

1.3 Prove algebraically whether the function is even, odd, or neither.

7. $f(x)=3x^3-2x$

8. $f(x)=-2x^4-4x+7$

2.5 For #9 – 11, simplify. Express the answer in a + bi form.

9. $(-6+3i)+(2+7i)$

10. $(2-i)-(-3+2i)$

11. $\dfrac{2+3i}{1-2i}$

3.3 12. Simplify

a. $\log_5 1$

b. $\log \sqrt[4]{10}$

c. $3^{\log_3 7}$

1.3 Sketch the graph of the piecewise-defined function. State whether the function is continuous or discontinuous at x = 0.

13. $f(x)=\begin{cases} x \ \ if \ \ x \le 0 \\ x^2 \ \ if \ \ x > 0 \end{cases}$

14. $f(x)=\begin{cases} -|x| \ \ if \ \ x < 0 \\ 2 \ \ if \ \ x \ge 0 \end{cases}$

3.2 15. A radioactive isotope decays at a rate of 3% per day. A scientist has an initial amount of 50 g. Write an equation of the form $y = ab^x$ for the number of grams y remaining after x days. Determine approximately how many days it will take for half the isotope to decay.

3.5 16. Solve: $\log_3 x + \log_3(x+8) = 2$

PreCalculus Second Semester Review
Chapters 4-6 & 9

Non-Calculator

4.2 17. Find each exact value.
4.3

(a) $\cos\left(\frac{3\pi}{4}\right)$ (b) $\sin\left(-\frac{7\pi}{6}\right)$

(c) $\tan\left(\frac{3\pi}{2}\right)$ (d) $\cos\left(-\frac{7\pi}{3}\right)$

4.3 18. Find one positive angle and one negative angle that are coterminal with: $\frac{3\pi}{4}$.

4.3 19. Given: $\sin\theta = -\frac{2}{3}$ and $\cos\theta > 0$. Find the values of the remaining five trigonometric functions of θ.

4.4 20. Write an equation of the cosine function with:

amplitude = 2 period = $\frac{\pi}{2}$ phase shift = $-\frac{\pi}{8}$ vertical shift = –3

4.4 21. Graph each function. Label axes. State the amplitude, period, phase shift, and vertical shift.

(a) $y = -3 \sin 2x$

(b) $y = 2 \cos\frac{1}{4}(x + \pi) - 3$

(c) $y = \tan x$

(d) $y = \sec x$

4.7 22. Find each value.

(a) $\arccos\left(\frac{\sqrt{2}}{2}\right)$

(b) $\cos^{-1}\left(-\frac{1}{2}\right)$

(c) $\sec\left[\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)\right]$

(d) $\sin\left[\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)\right]$

(e) $\cos[\arcsin(-1)]$

(f) $\sin^{-1}\left[\sin\left(\frac{5\pi}{6}\right)\right]$

5.3 23. Find the exact value of cos 105°.

5.4 24. If $\cos x = -\frac{12}{13}$ and x is in the second quadrant, find $\sin 2x$.

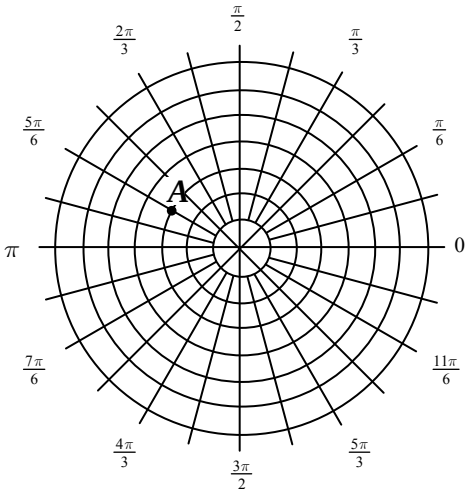
For #25 and # 26, solve each equation for $[0,2\pi)$.

C5 25. $2\sin^2 x = \sqrt{3}\sin x$

26. $8\cos^2 x = 4$

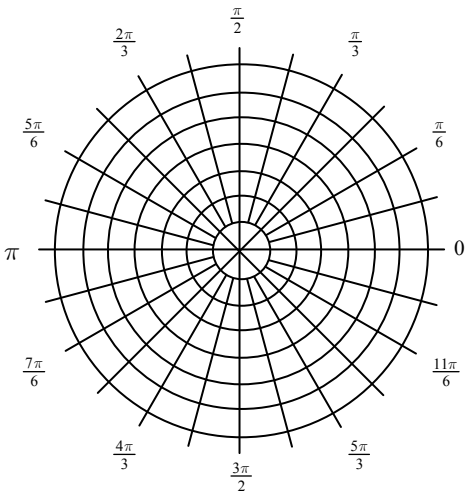
27. Solve for **all** values of x: $\cos^2 x - 2\sin^2 x + 2 = 0$

6.4 28. Name four different pairs of polar coordinates that represent point A if $[-2\pi, 2\pi]$.

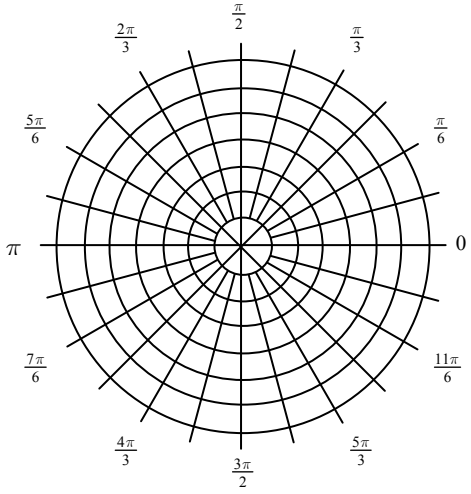


6.4 Graph:

29. $r = 3$



30. $\theta = -\frac{\pi}{4}$



6.4 31. Find the rectangular coordinate of the polar coordinate $\left(-8, -\frac{\pi}{4}\right)$.

6.4 32. Find the polar coordinate of the rectangular coordinate: $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

6.4 33. Write the rectangular equation $2x^2 + 2y^2 = 5y$ as a polar equation.

6.4 34. Write the polar equation $\theta = -\frac{\pi}{3}$ as a rectangular equation.

Calculator

4.1 35. Convert from DMS to decimal form: –250°36′ 10″. Round to the nearest tenth.

4.1 36. Convert from decimal form to DMS: 94.72°.

4.1 37. The wheel (including the tire) of a sports car under development by an auto company has an 11-inch radius. How many rpm's does the wheel make at 55 mph?

4.1 38. Find the measure of the intercepted arc in terms of π in a circle with diameter 60 inches and central angle of 72°.

4.6 39. The angle of elevation to the top of a building from a point 55 feet away from the building (on level ground) is 39°. Determine the height of the building.

4.6 40. A shoreline runs north-south, and a boat is due east of the shoreline. The bearings of the
5.6 boat from two points on the shore are 110° and 100°. Assume the two points are 550 feet apart. How far is the boat from the shore?

5.6 41. Find the area of each triangle to the nearest tenth.

(a) $a = 7$, $b = 12$, $c = 13$ (b) $A = 47°$, $b = 32$, $c = 19$

5.1-
5-4

For #42 – 45, simplify.

42. $1 - 2\sin^2 150°$.

43. $\sin\left(\frac{\pi}{5}\right)\cos\left(\frac{\pi}{2}\right) + \sin\left(\frac{\pi}{2}\right)\cos\left(\frac{\pi}{5}\right)$

44. $\sin\theta + \tan\theta\cos\theta$

45. $\frac{\sin\beta}{\csc\beta} + \frac{\cos\beta}{\sec\beta}$

For #46-48, verify that each equation is an identity.

5.2
5.3
5.4

46. $\frac{2\tan x}{1+\tan^2 x} = \sin 2x$

47. $\frac{\cos x}{1+\sin x} + \frac{\cos x}{1-\sin x} = 2\sec x$

48. $\sin(\pi - x) = \sin x$

4.7 5.5 5.6 49. Solve each triangle. Round angle and side measures to the nearest tenth.

(a) $a = 2$, $b = 7$, $C = 90°$

(b) $a = 125$, $A = 25°$, $b = 150$

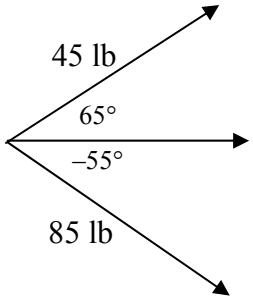
(c) $a = 1.5$, $b = 2.3$, $c = 1.9$

6.1 50. A vector has a magnitude of 3.4 cm and a direction of 27°. Find the magnitude of its vertical and horizontal components.

6.1 51. Given points $A(-6, 2)$ and $B(1, -3)$. Find the component form and magnitude of $\vec{AB}$.

6.1 52. Given $\langle -3,4 \rangle$. Find the magnitude and direction angle of the vector. For [0,360°]

6.1 53. A force of 45 lb acts on an object at an angle of 65°. A second force of 85 lb acts on the object at an angle of –55°. Find the direction and magnitude of the resultant force.



6.2 54. Find the dot product of $\boldsymbol{u}$ and $\boldsymbol{v}$. $\boldsymbol{u} = 2i - 3j$ and $\boldsymbol{v} = 3i + 5j$. Are $\boldsymbol{u}$ and $\boldsymbol{v}$ orthogonal?

6.2 55. Given vectors $\boldsymbol{u} = \langle -4,3 \rangle$ and $\boldsymbol{v} = \langle -1,7 \rangle$. Sketch the vectors and find the angle between the vectors.

6.2 56. The angle between a 150 pound force $\boldsymbol{F}$ and $\vec{AB} = 3i + 4j$ is 35°. Find the work done by $\boldsymbol{F}$ in moving an object from A to B.

6.3 57. Find a parametrization for the line through the points (–2,5) and (4,2).

6.3 58. Write an equation of the line in slope-intercept form whose parametric equations are $x = 5t - 1$ and $y = -3t + 8$.

6.3 59. Gretchen Austgen, an outfielder for the West Chicago Wildcats, is 215 feet from home plate after catching a fly ball. The runner tags third and heads for home. Gretchen releases the ball at an initial velocity of 75 ft/s at an angle of 25° with the horizontal. Assume Gretchen releases the ball 5 feet above the ground and aims it directly in line with the plate.

a. Write two parametric equations that represent the path of the ball.

b. Use a calculator to graph the path of the ball. Sketch the graph shown on the screen.

c. How far will the ball travel horizontally before hitting the ground?

d. When will the ball hit the ground?

e. What is the maximum height of the trajectory?

f. When will the object reach its maximum height?

9.1 60. How many different license plates can be created using two digits followed by three letters, if the digits may be repeated but the letters are not allowed to repeat?

9.1 61. How many different 4-member committees can be formed from an organization containing 35 members?

9.2 62. Find the sum of the terms of the arithmetic sequence: {28, 22, 16, 10, ..., –38}

9.2 63. Expand:

(a) $(x - 2)^4$

(b) $(2x + y)^5$

9.2 64. Find the coefficient of the x^8y^3 term in $(x+y)^{11}$.

9.3 65. The government designates a single cause for each death in the United States. The resulting data indicate that 45% of deaths are due to heart and other cardiovascular disease and 22% are due to cancer.

(a) What is the probability that the death of a randomly selected person will be due to cardiovascular disease or cancer?

(b) What is the probability that the death will be due to some other cause?

9.3 66. A die is rolled 5 ten times. Find the probability of getting:

(a) exactly four ones?

(b) at least four ones?

9.4 67. The sequence {2, 6, 18, 54, ...} is geometric. Find

(a) a recursive rule for the nth term.

(b) an explicit formula for the nth term.

For #68 and #69, find the sum of the infinite series, or state that the sum does not exist.

9.4 68. $\frac{1}{7}+\frac{5}{14}+\frac{25}{28}+...$

69. $\frac{1}{3}-\frac{2}{9}+\frac{4}{27}-...$

Semester Review Key

1. $x = -21$
2. $[0,\infty)$
3. $x = -\frac{5}{3}$
4. $x = 1, -4, \pm i$
5. u^2v^4
6. $\frac{6}{ab^4}$
7. $f(-x) = 3(-x)^3 - 2(-x)$
   $= -3x^3 + 2x$
   $\therefore$ Since $f(-x) = -f(x)$
   $f(x)$ is odd
8. $f(-x) = -2(-x)^4 - 4(-x) + 7$
   $= -2x^4 + 4x + 7$
   $\therefore$ Since $f(-x) \neq -f(x)$ nor $f(-x)$
   $f(x)$ is neither odd or even
9. $-4 + 10i$
10. $5 - 3i$
11. $-\frac{4}{5} + \frac{7}{5}i$
12. (a) 0 (b) $\frac{1}{4}$ (c) 7
13. see back for graph; continuous
14. see back for graph; discontinuous
15. $y = 50(0.97)^x$
    22.76 days
16. $x = 1$
17. (a) $-\frac{\sqrt{2}}{2}$ (b) $\frac{1}{2}$
    (c) undefined (d) $\frac{1}{2}$
18. samples: $\frac{11\pi}{4}; -\frac{5\pi}{4}$
19. $\csc\theta = -\frac{3}{2}$
    $\cos\theta = \frac{\sqrt{5}}{3}; \sec\theta = \frac{3}{\sqrt{5}}$
    $\tan\theta = -\frac{2}{\sqrt{5}}; \cot\theta = -\frac{\sqrt{5}}{2}$
20. $y = 2\cos 4\left(x + \frac{\pi}{8}\right) - 3$
21. to be done in class
22. (a) $\frac{\pi}{4}$ (b) $\frac{2\pi}{3}$ (c) 2
    (d) $-\frac{1}{2}$ (e) 0 (f) $\frac{\pi}{6}$
23. $\frac{\sqrt{2} - \sqrt{6}}{4}$
24. $-\frac{120}{169}$
25. $0, \pi, \pi/3, 2\pi/3$
26. $\pi/4, 3\pi/4, 5\pi/4, 7\pi/4$
27. $\pi/2 + 2\pi n$ & $3\pi/2 + 2\pi n$
28. $(3, 5\pi/6); (3, -7\pi/6); (-3, -\pi/6); (-3, 11\pi/6)$
29 & 30 see back
31. $\left(-4\sqrt{2}, 4\sqrt{2}\right)$
32. $\left(1, \frac{5\pi}{6}\right)$
33. $r = \frac{5}{2}\sin\theta$
34. $y = -x\sqrt{3}$
35. $-250.6°$
36. $94°43'12''$
37. 840.3 rpm
38. 12π
39. 44. 5 ft
40. 2931.09 ft,
41. (a) 41.6 sq. units
    (b) 222.3 sq. units
42. $\frac{1}{2}$
43. $\sin\left(\frac{7\pi}{10}\right)$
44. $2\sin\theta$
45. 1

46-48 to be done in class

49. (a) c = 7.3
    B = 74.1°; A = 15.9°
    (b) B = 30.5°; 149.5°
    C = 124.5°; 5.5°
    c = 243.8; 28.3
    (c) C = 55.3°; A = 40.5°
    B = 84.3°
50. vertical: 1.5
    horizontal: 3
51. $\langle 7, -5\rangle$; $\sqrt{74}$
52. 5; 127°
53. 73.65 lb., $\theta = -23.05°$
54. –9; no
55. 45°

56. 614.4 ft-lb.

57. $x = 6t - 2$
$y = -3t + 5$

58. $y = -\frac{3}{5}x + \frac{37}{5}$

59. (a) $x = 75(\cos 25)\, t$
$y = -16t^2 + 75(\sin 25)t + 5$
(c) 144.64 ft (d) 2.1279 sec
(e) 20.7 ft (f) .99 sec

60. 1,560,000

61. 52,360

62. –60

63. (a) $x^4 - 8x^3 + 24x^2 - 32x + 16$
(b) $32x^5 + 80x^4y + 80x^3y^2 + 40x^2y^3 + 10xy^4 + y^5$

64. 165

65. (a) 0.67 (b) 0.33

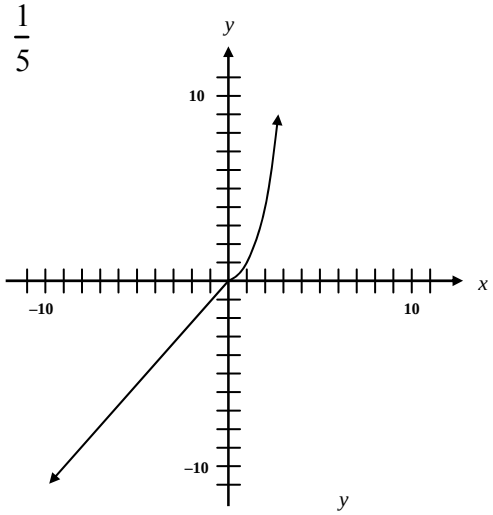
66. (a) $\frac{25}{7776}$ (b) $\frac{13}{3888}$

67. (a) $g_1 = 2$
$g_n = 3g_{n-1}$
(b) $g_n = 2(3)^{n-1}$

68. does not exist

69. $\frac{1}{5}$

13.



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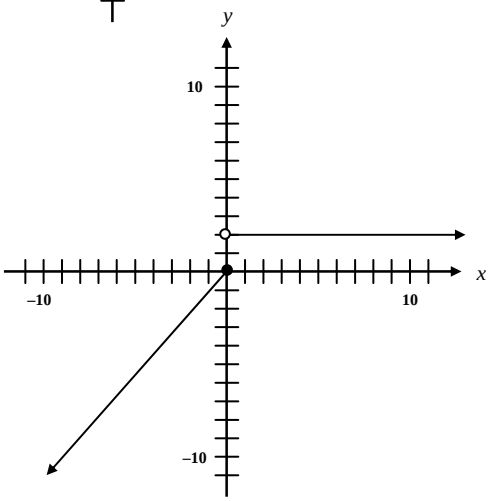

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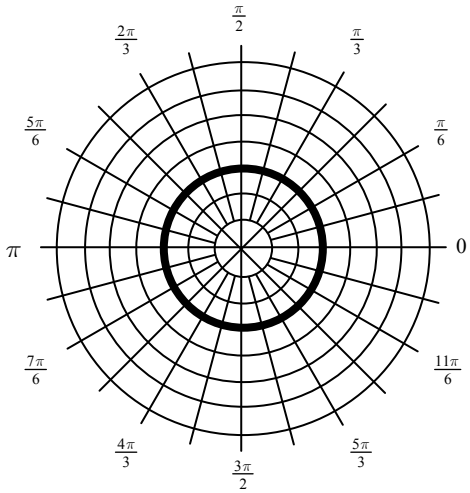

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