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. $\left(\frac{x-2}{3}-\frac{x+5}{2}=\frac{1}{3}\right)6$

$2(x-2)-3(x+5)=2$

$2x-4-3x-15=2$

$-x-19=2$

$\boxed{-21=x}$

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

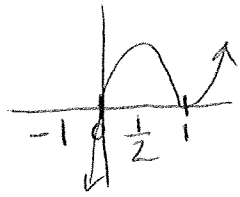
(express the answer using interval notation)

$x(x^2-2x+1)\geq 0$

$x(x-1)(x-1)\geq 0$

$(-)(-)(-)$ $(+)(-)(-)$ $(+)(+)(+)$

neg 0 pos pos



$\boxed{[0,\infty)}$

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

$3x(x-2)+5(x+1)=15$

$3x^2-6x+5x+5=15$

$3x^2-x-10=0$

$-30|-1$

$-6\ 5$

	x	-2
$3x$	$3x^2$	$-6x$
$+5$	$15x$	-10

$(x-2)(3x+5)=0$

$x=2,\ -5/3$

$\boxed{x=-5/3}$

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

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

	1	3	−3	3	−4
1		1	4	1	4
	1	4	1	4	0
−4		−4	0	−4	
	1	0	1	0	

x^2+0x+1

$x=\frac{0\pm\sqrt{0-4}}{2(1)}$

$=\pm\frac{2i}{2}$

$=\pm i$

$\boxed{x=1,-4,\pm i}$

P1 Simplify. Express your answer without negative exponents.

5. $\frac{(uv^{-2})^{-3}}{u^{-5}v^2}=\frac{u^{-3}v^6}{u^{-5}v^2}=\boxed{u^2v^4}$

6. $\frac{4a^3b}{a^2b^3}\cdot\frac{3b^2}{2a^2b^4}=\frac{12a^3b^3}{2a^4b^7}=6a^{-1}b^{-4}=\boxed{\frac{6}{ab^4}}$

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

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

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

$=-3x^3+2x$

$=-f(x)$

$\therefore f(x)$ is odd

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

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

$=-2x^4+4x+7$

$\neq f(x)$

$\neq -f(x)$

$f(x)$ is neither

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

9. $(-6+3i)+(2+7i) = \boxed{-4+10i}$

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

$2-i+3-2i$

$\boxed{5-3i}$

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

$\frac{2+4i+3i+6i^2}{1+2i-2i-4i^2} = \frac{2+7i-6}{1+4} = \frac{-4+7i}{5} = \boxed{-\frac{4}{5}+\frac{7}{5}i}$

3.3 12. Simplify each expression.

(a) $\log_5 1$

$5^x = 1$

$\boxed{x=0}$

(b) $\log \sqrt[4]{10}$

$10^x = \sqrt[4]{10}$

$10^x = 10^{\frac{1}{4}}$

$\boxed{x=\frac{1}{4}}$

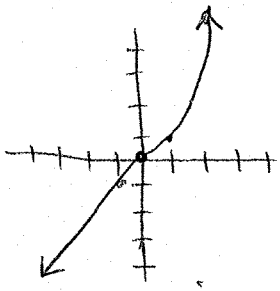
(c) $3^{\log_3 7} = \boxed{7}$

$3^{\log_3 7} = n$

$\log_3 n = \log_3 7$

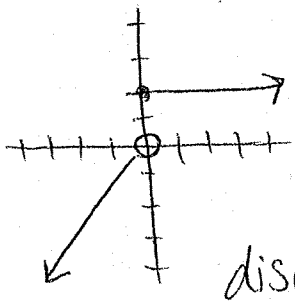
1.3 Sketch the graph of the piecewise-defined function. State whether the function is continuous or discontinuous at x = 0.

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



continuous

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



discontinuous

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.

Graphing: $y = 50(.97)^x$

$y = 25$

$\boxed{x = 22.8}$

Algebraically: $25 = 50(.97)^x$

$.5 = (.97)^x$

$\log_{.97}(.5) = x$

$\frac{\log .5}{\log .97} = x$

$x = 22.8$

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

$\log_3 \quad x(x+8) = 2$

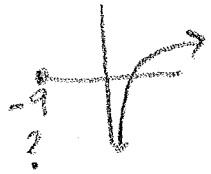
$3^2 = x^2 + 8x$

$0 = x^2 + 8x - 9$

$0 = (x+9)(x-1)$

$x = \cancel{-9}, 1$

$\boxed{x = 1}$



PreCalculus Second Semester Review
Chapters 4-6 & 9

Non-Calculator

4.2 *4.3* 17. Find each exact value.

(a) $\cos\left(\frac{3\pi}{4}\right) = \boxed{-\frac{\sqrt{2}}{2}}$

(b) $\sin\left(-\frac{7\pi}{6}\right) = \boxed{\frac{1}{2}}$ $\theta_{ref} = \frac{\pi}{6}$

(c) $\tan\left(\frac{3\pi}{2}\right)$ $\frac{-1}{0} = \boxed{\text{undef}}$ $(0,-1)$

(d) $\cos\left(-\frac{7\pi}{3}\right) = \boxed{\frac{1}{2}}$ $\theta_{ref} = \frac{\pi}{3}$

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

$\frac{4\pi}{4}$ pos: $\frac{11\pi}{4}$, neg: $-\frac{5\pi}{4}$

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

$(-2)^2 + x^2 = 3^2$

$x^2 = 9 - 4$

$x = \sqrt{5}$

$\cos\theta = \frac{\sqrt{5}}{3}$ $\quad \csc\theta = -\frac{3}{2}$

$\tan\theta = \frac{-2}{\sqrt{5}}$ $\quad \sec\theta = \frac{3}{\sqrt{5}}$

$\cot\theta = \frac{\sqrt{5}}{-2}$

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

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

$b\pi = 4\pi$

$b = 4$

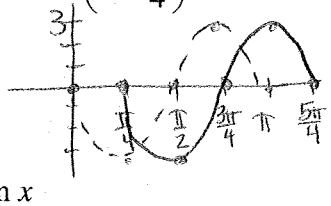
$\boxed{y = 2\cos\left[4\left(x + \frac{\pi}{8}\right)\right] - 3}$

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

$y = -3\sin 2\left(x - \frac{\pi}{4}\right)$

(a) $y = -3\sin 2\left(x - \frac{\pi}{4}\right)$

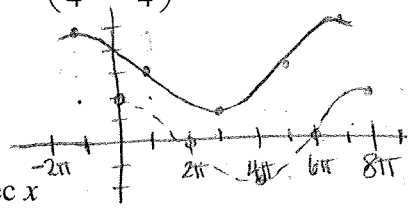
amp: 3 *flip
per: π
ps: $\pi/4$
vs: 0



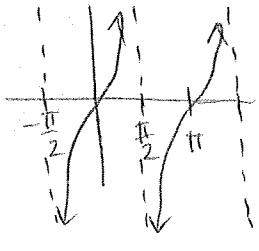
$y = 2\cos\frac{1}{4}(x + \pi) + 3$

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

amp: 2
per: $\frac{2\pi}{\frac{1}{4}} = 8\pi$
ps: $-\pi$
vs: 3

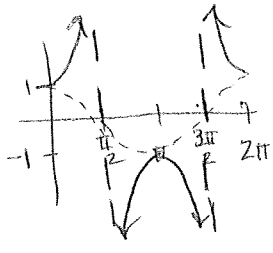


(c) $y = \tan x$



per: π
no amp,
ps or vs

(d) $y = \sec x$



per: 2π
no amp, ps
or vs

4.7 22. Find each value.

(a) $\arccos\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$

(b) $\cos^{-1}\left(-\frac{1}{2}\right) = \frac{2\pi}{3}$

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

(d) $\sin\left[\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)\right] = -\frac{1}{2}$

(e) $\cos[\arcsin(-1)]$ $\cos\left(-\frac{\pi}{2}\right) = 0$

(f) $\sin^{-1}\left[\sin\left(\frac{5\pi}{6}\right)\right]$ $\sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$

4.7 23. Write an algebraic expression equivalent to $\tan(\sin^{-1} 2x)$. *Hint:* Draw a Δ

$a^2 + (2x)^2 = 1^2$

$a^2 = 1 - 4x^2$

$a = \sqrt{1-4x^2}$

$\tan\theta = \frac{2x}{\sqrt{1-4x^2}}$

5.3 24. Find the exact value of $\cos 105°$.

$\cos(60° + 45°) = \cos 60° \cos 45° - \sin 60° \sin 45°$

$= \frac{1}{2} \cdot \frac{\sqrt{2}}{2} - \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} = \frac{\sqrt{2} - \sqrt{6}}{4}$

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

$\sin 2x = 2 \sin x \cos x$

$= 2\left(\frac{5}{13}\right)\left(-\frac{12}{13}\right)$

$= \frac{-120}{169}$

For #26 and # 27, solve each equation for $[0, 2\pi)$.

C5 26. $2\sin^2 x = \sqrt{3}\sin x$

$2\sin^2 x - \sqrt{3}\sin x = 0$

$\sin x(2\sin x - \sqrt{3}) = 0$

$\sin x = 0$ $\quad \sin x = \frac{\sqrt{3}}{2}$

$x = 0, \pi$ $\quad x = \frac{\pi}{3}, \frac{2\pi}{3}$

$x = 0, \pi, \frac{\pi}{3}, \frac{2\pi}{3}$

27. $8\cos^2 x = 4$

$\cos^2 x = \frac{1}{2}$

$\cos x = \pm\frac{1}{\sqrt{2}}$

$x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

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

$1 - \sin^2 x - 2\sin^2 x + 2 = 0$

$-3\sin^2 x + 3 = 0$

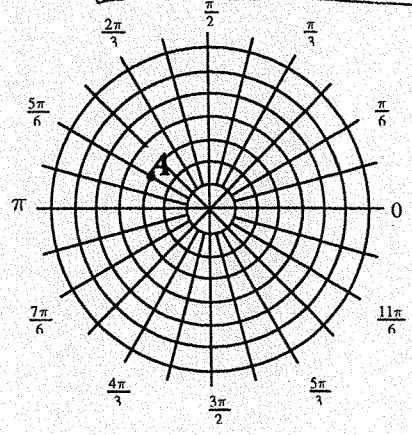
$-3(\sin^2 x - 1) = 0$

$\sin^2 x = 1$

$\sin x = \pm 1$

$x = \frac{\pi}{2} + 2\pi n$ $\quad x = \frac{3\pi}{2} + 2\pi n$

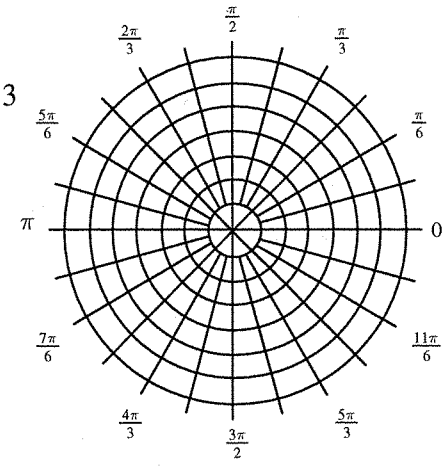
6.4 29. Name four different pairs of polar coordinates that represent point A if $[-2\pi, 2\pi]$.



Omit

6.4 Graph:

30. $r = 3$



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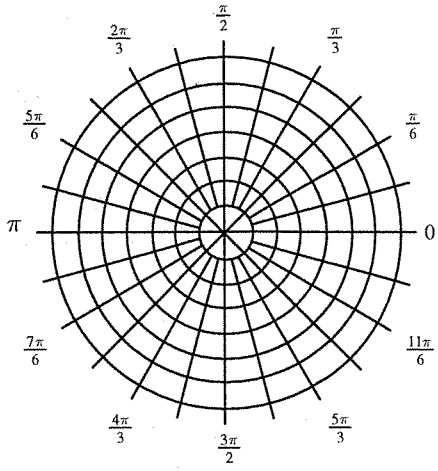
31. $\theta = -\frac{\pi}{4}$



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

omit

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

omit

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

omit

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

omit

Calculator

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

$\frac{36'}{} \left| \frac{1^\circ}{60'} \right. = .6$ $\quad \frac{10''}{} \left| \frac{1^\circ}{3600''} \right. = .003$ $\quad -250.603^\circ$ $\quad \boxed{-250.6^\circ}$

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

$.72^\circ \left| \frac{60'}{1^\circ} \right. = 43.2'$ $\quad .2' \left| \frac{60''}{1'} \right. = 12$ $\quad \boxed{94^\circ 43' 12''}$

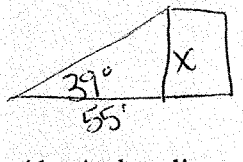
4.1 38. The wheel (including the tire) of a sports car under development by an auto company has an 11-inch radius. How many rpm's does the wheel make at 55 mph?

$\frac{55 \text{ miles}}{\text{hour}} \left| \frac{5280 \text{ ft}}{1 \text{ mi}} \right| \frac{12 \text{ in}}{1 \text{ ft}} \left| \frac{1 \text{ rev}}{2\pi \cdot 11 \text{ in}} \right| \frac{1 \text{ hr}}{60 \text{ min}} = \boxed{840.3 \text{ rpm}}$

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

$S = r\theta \cdot \frac{\pi}{180}$ $\quad S = 72 \cdot 30 \cdot \frac{\pi}{180} =$ **12π inches**

4.6 40. 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.

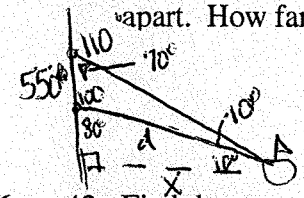


$\tan 39° = \frac{x}{55}$

$55 \tan 39° = x$

$x = 44.5$ ft

4.6 *5.6* 41. A shoreline runs north-south, and a boat is due east of the shoreline. The bearings of the 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?



$\frac{\sin 10°}{550} = \frac{\sin 70°}{d}$

$d = \frac{550 \sin 70°}{\sin 10°} = 2976.3$

$\cos 10° = \frac{x}{2976.3}$

$x = 2931.1$ ft

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

(a) $a = 7, b = 12, c = 13$

$s = \frac{7+12+13}{2} = 16$

$\text{Area} = \sqrt{16(16-7)(16-12)(16-13)} =$ **41.6**

(b) $A = 47°, b = 32, c = 19$

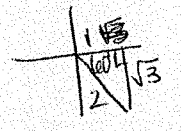
$\text{Area} = \frac{1}{2} \cdot 32 \cdot 19 \sin 47°$

$\text{Area} =$ **222.3**

5.1-5.4 For #43 – 46, simplify.

43. $1 - 2\sin^2 150° = \cos 2(150°)$

$= \cos 300°$



$= \frac{1}{2}$

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

$\sin\left(\frac{2\pi}{10} + \frac{5\pi}{10}\right) =$ **$\sin\left(\frac{7\pi}{10}\right)$**

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

$\sin\theta + \frac{\sin\theta}{\cos\theta} \cdot \cos\theta$

$2\sin\theta$

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

$\frac{\sin\beta}{\frac{1}{\sin\beta}} + \frac{\cos\beta}{\frac{1}{\cos\beta}} = \sin^2\beta + \cos^2\beta =$ **1**

For #47 – 48, verify that each equation is an identity.

5.2 *5.3* *5.4* 47. $\frac{2\tan x}{1+\tan^2 x} = \sin 2x$

LS → $\frac{2\tan x}{\sec^2 x} = \frac{2\sin x}{\frac{\cos x}{1}} \cdot \frac{\cos^2 x}{\cos^2 x}$

$= 2\sin x \cos x$

$= \sin 2x$ ✓

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

LS: $\frac{\cos x(1-\sin x) + \cos x(1+\sin x)}{1-\sin^2 x}$

$= \frac{\cos x - \cos x \sin x + \cos x + \cos x \sin x}{1-\sin^2 x}$

$= \frac{2\cos x}{\cos^2 x} = \frac{2}{\cos x} = 2\sec x = RS$ ✓

$(-1, 0)$

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

LS: $\sin\pi\cos x - \cos\pi\sin x$

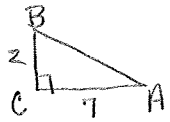
$= -(-1)\sin x$

$= \sin x = RS$ ✓

4.7 50. Solve each triangle. Round angle and side measures to the nearest tenth.

5.5

5.6 (a) a = 2, b = 7, C = 90°



$\tan A = \frac{2}{7}$

$A = \tan^{-1}\left(\frac{2}{7}\right)$

$A = 15.9°$

$B = 74.1°$

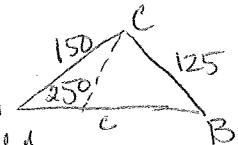
$C = 7.3$

$2^2 + 7^2 = c^2$

$\sqrt{4+49} = c^2$

$\sqrt{53} = c^2$

(b) a = 125, A = 25°, b = 150



1st △

$\frac{\sin 25°}{125} = \frac{\sin B}{150}$

$B = 30.5°$

$C = 124.5°$

$\frac{\sin 25°}{125} = \frac{\sin 124.5°}{c}$

$C = 243.8$

2nd △

$B = 180 - 30.5$

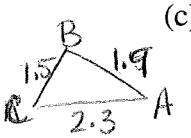
$B = 149.5°$

$C = 5.5°$

$\frac{\sin 25°}{125} = \frac{\sin 5.5°}{c}$

$c = 28.3$

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



$2.3^2 = 1.5^2 + 1.9^2 - 2(1.5)(1.9)\cos B$

$5.29 = 5.86 - 5.7\cos B$

$-.57 = -5.7\cos B$

$.1 = \cos B$

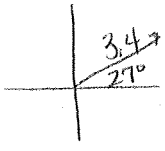
$B = 84.3°$

$\frac{\sin 84.3°}{2.3} = \frac{\sin A}{1.5}$

$A = 40.5°$

$C = 55.2°$

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



$x = 3.4\cos 27° = 3.0 = H$

$y = 3.4\sin 27° = 1.5 = V$

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

$\vec{AB} = \langle 1-(-6), -3-2 \rangle$

$\vec{AB} = \langle 7, -5 \rangle$

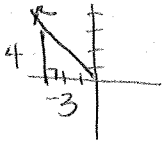
$|\vec{AB}| = \sqrt{7^2 + (-5)^2}$

$= \sqrt{49+25}$

$= \sqrt{74}$

omit 2010

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



$\tan\theta = \frac{4}{-3}$

$\theta = \tan^{-1}\left(\frac{4}{-3}\right)$

$\theta = 126.9°$

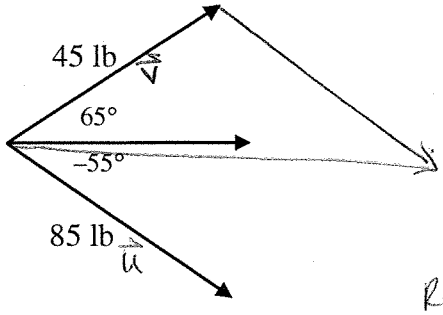
$\theta_{ref} = 53.1°$

$|\vec{v}| = \sqrt{(-3)^2 + 4^2}$

$= \sqrt{9+16}$

$|\vec{v}| = 5$

6.1 54. 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.



$\vec{v} = \langle 45\cos 65°, 45\sin 65° \rangle$

$\vec{v} = \langle 19.02, 40.78 \rangle$

$\vec{u} = \langle 85\cos -55°, 85\sin -55° \rangle$

$\vec{u} = \langle 48.75, -69.63 \rangle$

Resultant $= \langle 19.02+48.75, 40.78-69.63 \rangle$

$= \langle 67.8, -28.9 \rangle$

$\tan\theta = \frac{-28.9}{67.8}$

$\theta = -23.1°$

mag $= \sqrt{67.8^2 + (-28.9)^2} = 73.7$

6.2 55. 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 56. 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 57. 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 58. Find a parametrization for the line through the points (–2,5) and (4,2).

$\Delta x = 4-(-2) = 6$

$\Delta y = 2-5 = -3$

$x = -2+6t$

$y = 5-3t$

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

$x+1 = 5t$

$\frac{x+1}{5} = t$

$y = -3\left(\frac{x+1}{5}\right)+8$

$y = \frac{-3}{5}x - \frac{3}{5} + 8$

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

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6.3 60. 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.

$x = 75\cos 25° t$

$y = -16t^2 + 75\sin 25° t + 5$

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

$t \to 0, 4, .1 \quad x \to 0, 180, 20 \quad y \to -5, 30, 5$

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

$\approx 144.1'$

d. When will the ball hit the ground?

$t = 2.12$ sec

e. What is the maximum height of the trajectory?

$20.7'$

f. When will the object reach its maximum height?

$t = .985$ sec

$0 = -16t^2 + 31.7t + 5$

$t = \frac{-31.7 \pm \sqrt{31.7^2 - 4(-16)(5)}}{-32} = \frac{-31.7 \pm 36.4}{-32}$

$t = +2.12, -.15$

9.1 61. 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?

$10 \cdot 10 \quad 26 \cdot 25 \cdot 24 = \boxed{1{,}560{,}000}$

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

$35C_4 = \boxed{52{,}360}$

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

$d = -6 \quad -38 = 28 + (n-1)(-6)$

$-66 = -6(n-1)$

$11 = n-1$

$12 = n$

$S_n = \frac{12}{2}(28 - 38) = 6(-10) = \boxed{-60}$

9.2 64. Expand:

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

$4C_0\, x^4 + (-2)^0 = 1x^4$

$4C_1\, x^3 + (-2)^1 = 4x^3(-2)$

$4C_2\, x^2 + (-2)^2 = 6x^2(4)$

$4C_3\, x^1 + (-2)^3 = 4x(-8)$

$4C_4\, x^0 + (-2)^4 = 1(16)$

$\boxed{x^4 - 8x^3 + 24x^2 - 32x + 16}$

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

$5C_0\,(2x)^5(y)^0 = 1(32x^5)$

$5C_1\,(2x)^4(y)^1 = 5(16x^4)(y)$

$5C_2\,(2x)^3(y)^2 = 10(8x^3)(y^2)$

$5C_3\,(2x)^2(y)^3 = 10(4x^2)(y^3)$

$5C_4\,(2x)^1(y)^4 = 5(2x)(y^4)$

$5C_5(2x)^0(y)^5 = y^5$

$\boxed{32x^5 + 80x^4y + 80x^3y^2 + 40x^2y^3 + 10xy^4 + y^5}$

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

$11C_3\, x^8y^3 = \boxed{165}$

9.3 66. 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?

$.45 + .22 = .67 \quad \boxed{67\%}$

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

$1 - 67\% = 1 - .67 = .33 \quad \boxed{33\%}$

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

(a) exactly four ones? $5C_4\left(\frac{1}{6}\right)^4\left(\frac{5}{6}\right)^1 = \boxed{.0032}$ OR $\boxed{\frac{25}{7776}}$

(b) at least four ones? $P(\text{at least four}) = P(4) \text{ or } P(5)$

$= .0032 + 5C_5\left(\frac{1}{6}\right)^5\left(\frac{5}{6}\right)^0$

$= .0032 + .000129$

$= \boxed{.0033}$ or $\boxed{\frac{13}{3888}}$

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

(a) a recursive rule for the nth term. $g_1 = 2$, $g_n = 3 \cdot g_{n-1}$ for $n \geq 1$

(b) an explicit formula for the nth term.

$g_n = g_1 \cdot r^{n-1}$ $\quad g_n = 2 \cdot 3^{n-1}$

9.4 69. The fourth and tenth terms of an arithmetic sequence are 7 and 49 respectively. Find the...

(a) the common difference $= 7$

(b) $a_1 = -14$

(c) a recursive formula

$a_1 = -14$, $a_n = a_{n-1} + 7$ for $n > 1$

_ _ _ 7 _ _ _ _ _ 49

$49 = 7 + 6d$

$42 = 6d$

$7 = d$

$7 = a_1 + 7(4-1)$

$7 = a_1 + 7(3)$

$7 = a_1 + 21$

$-14 = a_1$

9.4 70. The fourth and ninth terms of a geometric sequence are 128 and 131072 respectively. Find

a) the common ratio $= 4$

b) $a_1 = 2$

c) an explicit formula

$g_n = 2 \cdot 4^{n-1}$

_ _ _ 128 _ _ _ _ 131072 5 ratios

$131072 = 128r^5$

$1024 = r^5$

$4 = r$

$128 = a_1 \cdot 4^{4-1}$

$128 = 64a_1$

9.4 For #71 and #72, write the series using sigma notation.

71. $2 + 5 + 8 + 11 + 14 + \ldots$

arith. $d = 3$

$\sum_{k=1}^{\infty} 2 + 3(k-1)$

72. $6 + 2 + \frac{2}{3} + \frac{2}{9} + \ldots + \frac{2}{729}$ $\quad \frac{2}{729} = 6\left(\frac{1}{3}\right)^{n-1}$ $\quad \left(\frac{1}{6}\right)$

geom. $r = \frac{1}{3}$

$\frac{1}{2187} = \left(\frac{1}{3}\right)^{n-1}$

$\left(\frac{1}{3}\right)^7 = \left(\frac{1}{3}\right)^{n-1}$

$n - 1 = 7$

$n = 8$

$\sum_{n=1}^{8} 6\left(\frac{1}{3}\right)^{n-1}$

For #73 and #74, find the sum of the infinite series, or state that the sum does not exist.

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

$r = \frac{5}{2} > 1$

does not exist

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

$r = -\frac{2}{3}$

$S_\infty = \frac{\frac{1}{3}}{1 - (-\frac{2}{3})}$

$= \frac{\frac{1}{3}}{1 + \frac{2}{3}}$

$= \frac{\frac{1}{3}}{\frac{5}{5}} = \frac{1}{3} \cdot \frac{3}{5} = \frac{1}{5}$