KEY

PreCalculus Second Semester Review
Ch. P to Ch. 3 (1st Semester) ~ No Calculator

Solve. Express answer using interval notation where appropriate. Check for extraneous solutions.

P3 1. $\left(\dfrac{x-2}{3} - \dfrac{x+5}{2} = \dfrac{1}{3}\right) 6$

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

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

$-x - 19 = 2$

$-x = 21$

$\boxed{x = -21}$

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

$\left(\dfrac{3x}{x+1} + \dfrac{5}{x-2} = \dfrac{15}{(x-2)(x+1)}\right)(x+1)(x-2)$

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

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

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

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

$\boxed{x = -\frac{5}{3}}$ or $\cancel{x=2}$ extraneous

2.4 3. Find the zeros of the function $f(x) = x^4 + 3x^3 - 3x^2 + 3x - 4$ given zeros $x = 1$ and $x = -4$

$$\begin{array}{r|rrrrr} 1 & 1 & 3 & -3 & 3 & -4 \\ & & 1 & 4 & 1 & 4 \\ \hline -4 & 1 & 4 & 1 & 4 & \boxed{0} \\ & & -4 & 0 & -4 & \\ \hline & 1 & 0 & 1 & \boxed{0} & \end{array}$$

$x^2 + 1 = 0$

$x^2 = -1$

$x = \pm\sqrt{-1} = \pm i$

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

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

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

USE SIGN CHART!

$-\ 0\ +\ 0\ +$

$0 \quad 1$

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

P1 Simplify. Express your answer without negative exponents.

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

6. $\dfrac{4a^3b}{a^2b^3} \cdot \dfrac{3b^2}{2a^2b^4}$ $\quad \dfrac{12a^3b^3}{2a^4b^7} = \boxed{\dfrac{6}{ab^4}}$

P4 7. Write the equation of a line a) parallel to and b) perpendicular to $5x - y = 7$ and passing through the point $(3, -4)$.

slope $= 5$ $\quad$ slope $= -\frac{1}{5}$

$-y = 7 - 5x$

$y = -7 + 5x$

slope $= 5$

a) $y + 4 = 5(x - 3)$

b) $y + 4 = -\frac{1}{5}(x - 3)$

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

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

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

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

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

$f(-x) = -f(x)$ $\therefore$ $f(x)$ is ODD

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

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

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

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

$f(-x) \neq f(x)$ and $f(-x) \neq -f(x)$ $\therefore$ $f(x)$ is NEITHER

1.2 Find the domain. Express the answer in interval notation.

10. $g(x) = \sqrt{6-5x}$ → CANNOT BE NEGATIVE!

$6-5x \geq 0$

$-5x \geq -6$

$x \leq 6/5$

Domain $\boxed{(-\infty, \frac{6}{5}]}$

11. $f(x) = \log(x+3)$ cannot be zero & cannot be negative

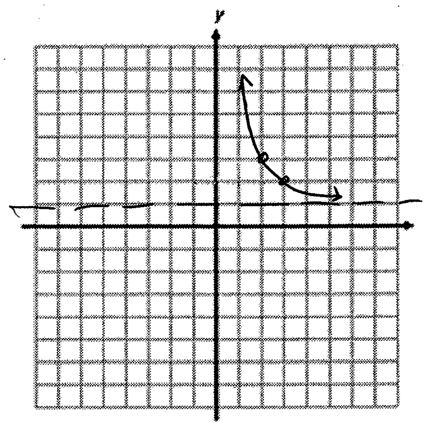
$x+3 > 0$

$x > -3$

Domain $\boxed{(-3, \infty)}$

1.5 Identify the parent function, as well as the transformation. Then, graph the function including key points and/or asymptotes.

12. $f(x) = 2^{3-x} + 1 = 2^{-x+3} + 1 = 2^{-(x-3)} + 1$

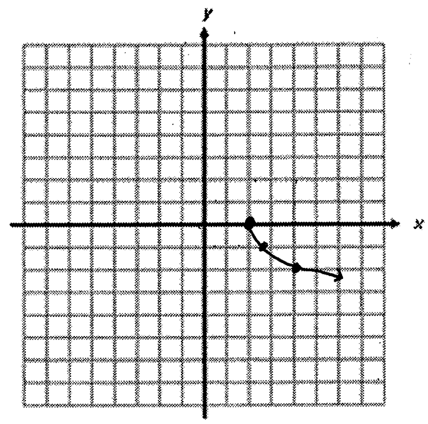


Parent: $y = 2^x$

$(-x+3, y+1)$

HA $y=1$

13. $g(x) = -\sqrt{2x-4} = -\sqrt{2(x-2)}$

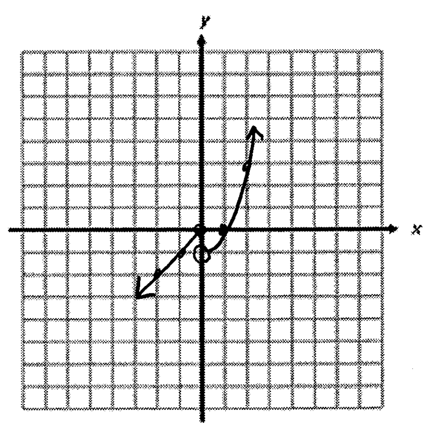


$(\frac{1}{2}x+2, -y)$

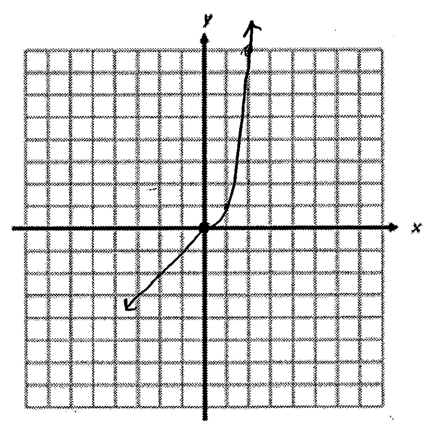
Parent: $y = \sqrt{x}$

1.3 Graph the piecewise-defined function. State whether the function is continuous or discontinuous at $x = 0$.

14. $f(x) = \begin{cases} x & \text{if } x \leq 0 \\ x^2 - 1 & \text{if } x > 0 \end{cases}$



15. $f(x) = \begin{cases} -|x| & \text{if } x < 0 \\ x^3 & \text{if } x \geq 0 \end{cases}$



1.4 16. Find the inverse of $h(x) = \sqrt[3]{6x-1}$

$x = \sqrt[3]{6y-1}$

$x^3 = 6y - 1$

$x^3 + 1 = 6y$

$\frac{x^3+1}{6} = y$

$\therefore h^{-1}(x) = \frac{x^3+1}{6}$

2.5 17. Simplify. Express the answer in a + bi form.

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

2.7 Find (if it exists) the a) asymptotes, b) intercepts, and c) domain of the function. Be sure to list any holes.

18. $g(x) = \dfrac{x^2-9}{2x^2-x-15} = \dfrac{(x+3)\cancel{(x-3)}}{(2x+5)\cancel{(x-3)}}$

Domain: $x \neq -5/2$ & $x \neq 3$

$\boxed{(-\infty, -5/2) \cup (-5/2, 3) \cup (3, \infty)}$

VA: $x = -5/2$

HA: $y = 1/2$

Hole when $x = 3$ @ $(3, 3/11)$

x-int: $(-3, 0)$

y-int: $(0, 3/5)$

3.3 19. Simplify each expression.

(a) $\log_5 1 = \boxed{0}$

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

$\log 10^{1/4} = \boxed{1/4}$

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

3.4 20. Expand each logarithm:

(a) $\log_2\left(\dfrac{8\sqrt[5]{x}}{y}\right)$

$\log_2 8 + \log_2 x^{1/5} - \log_2 y$

$\boxed{3 + \frac{1}{5}\log_2 x - \log_2 y}$

(b) $\log\left(\dfrac{\sqrt{x^5}}{10}\right)$

$\log x^{5/2} - \log 10$

$\boxed{\frac{5}{2}\log x - 1}$

(c) $\ln(6x^4e^3)$

$\ln 6 + \ln x^4 + \ln e^3$

$\boxed{\ln 6 + 4\ln x + 3}$

Calculator Allowed.

3.2 21. A radioactive isotope decays at a rate of 3% per day. A scientist has an initial amount of 50 g. Write a model for this situation. Determine approximately how many days it will take for half the isotope to decay.

$Y = 50(.97)^x$

x = # of days

y = amount left after x days

$25 = 50(.97)^x$

$\frac{1}{2} = (.97)^x$

$\log_{.97}\left(\frac{1}{2}\right) = x$

$\boxed{x \approx 22.757 \text{ DAYS}}$ until 1/2 has decayed

3.5 22. Solve algebraically:

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

$\log_3\left(x^2+8x\right) = 2$

$9 = x^2+8x$

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

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

$\cancel{x=-9}$ or $\boxed{x=1}$

extraneous

(b) $\log_2(x+5) - \log_2 x = 7$

$\log_2\left(\frac{x+5}{x}\right) = 7$

$2^7 = \frac{x+5}{x}$

$128x = x+5$

$127x = 5$

$\boxed{x = 5/127}$

(c) $3^{\frac{x}{2}} - 6 = 42$

$3^{x/2} = 48$

$\frac{x}{2} = \log_3(48)$

$x = 2\log_3(48)$

$\boxed{x \approx 7.047438029}$

(d) $-27 = -3 \cdot \left(\frac{1}{4}\right)^{6x}$

$9 = \left(\frac{1}{4}\right)^{6x}$

$\log_{\frac{1}{4}}(9) = 6x$

$\frac{\log_{1/4}(9)}{6} = x$

$\boxed{x \approx -.2641604168}$

Ch. 4, Ch. 5, 9.2, 9.4, 6.1and 6.3 (2nd Semester) ~ No Calculator

4.2
4.3 23. Find each exact value.

(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) $\cos\left(\frac{-7\pi}{3}\right)$

$\frac{-1}{\sqrt{2}}$ OR $-\frac{\sqrt{2}}{2}$

$\frac{1}{2}$

$\frac{-1}{0} \Rightarrow \boxed{\text{undefined}}$

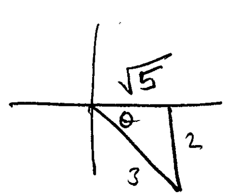
$\frac{1}{2}$

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

$\frac{11\pi}{4}$ $\quad$ $-\frac{5\pi}{4}$

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

QIV



$\sin\theta = -2/3$ $\quad$ $\csc\theta = -3/2$

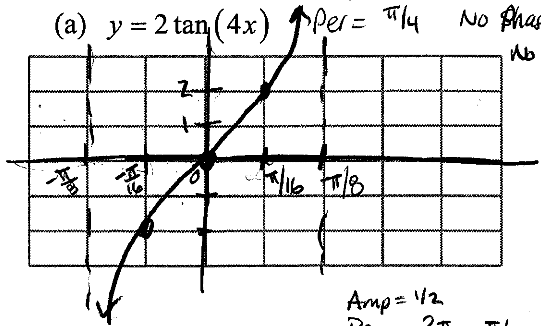
$\cos\theta = \sqrt{5}/3$ $\quad$ $\sec\theta = 3/\sqrt{5}$

$\tan\theta = -2/\sqrt{5}$ $\quad$ $\cot\theta = -\sqrt{5}/2$

4.4 26. State the amplitude, period, phase shift, and vertical shift, and then graph each function. Clearly label all tick marks on the axes.

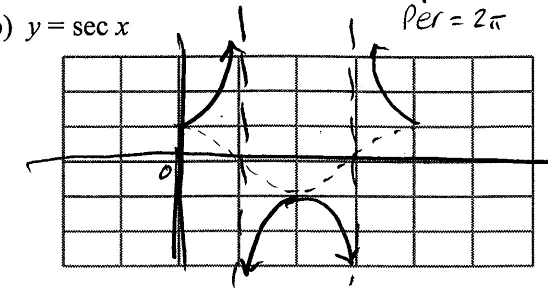
(a) $y = 2\tan(4x)$

Amp = N/A (vert. stretch by 2)
Per = $\pi/4$ No Phase Shift
No Vert. Shift



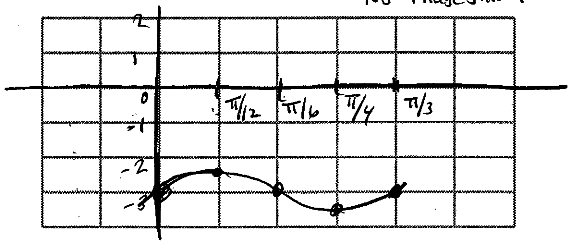
(b) $y = \sec x$

Amp = N/A No Shift
Per = 2π



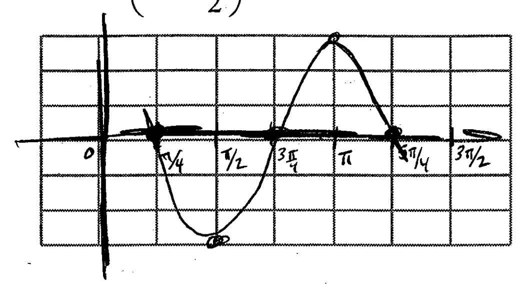
(c) $y = \frac{1}{2}\sin(6x) - 3$

Amp = 1/2
Per = $\frac{2\pi}{6} = \pi/3$
Down 3
No Phase Shift



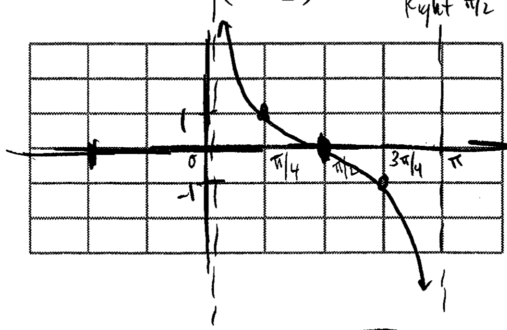
(d) $y = -3\sin\left(2x - \frac{\pi}{2}\right)$ $= -3\sin\left(2\left(x - \pi/4\right)\right)$

Amp = 3 (flip over x-axis)
Per = $\frac{2\pi}{2} = \pi$
Right $\frac{\pi}{4}$
No Vert. Shift



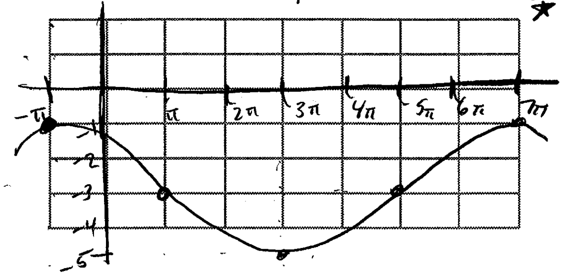
(e) $y = -\tan\left(x - \frac{\pi}{2}\right) + 2$

Amp = N/A (flipped over x)
Per = π up 2
Right $\pi/2$



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

Amp = 2 Per = 8π Left π Down 3

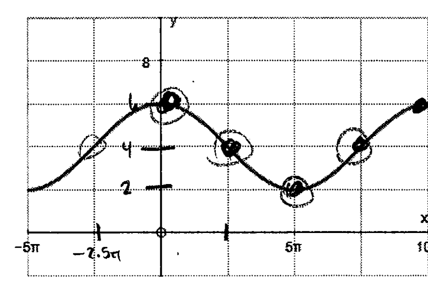


4.4 27. Write an equation of the cosine function with amplitude = 2, period = $\frac{\pi}{2}$, phase shift = $-\frac{\pi}{8}$ and vertical shift = – 3.

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

4.4 28. Use the given graph…

amp = 2
$p = 10\pi$
$b = \frac{1}{5}$
up 4



5.3 (a) Write a sine function that fits the graph.

Left 2.5π

$y = 2\sin\left(\frac{1}{5}\left(x + \frac{5\pi}{2}\right)\right) + 4$

(b) Write a cosine function that fits the graph.

$y = 2\cos\left(\frac{1}{5}x\right) + 4$

(c) Using identities, prove that the two equations you wrote are equal.

$$2\sin\left(\tfrac{1}{5}\left(x + 5\pi/2\right)\right) + 4 = 2\sin\left(\tfrac{1}{5}x + \tfrac{\pi}{2}\right) + 4$$
$$= 2\left[\sin\left(\tfrac{1}{5}x\right)\cos\left(\pi/2\right) + \cos\left(\tfrac{1}{5}x\right)\sin\left(\pi/2\right)\right] + 4$$
$$= 2\left[\cancel{\sin\left(\tfrac{1}{5}x\right)\cdot 0} + \cos\left(\tfrac{1}{5}x\right)\cdot 1\right] + 4$$
$$= 2\cos\left(\tfrac{1}{5}x\right) + 4 \checkmark$$

4.7 29. Find each value.

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

$\pi/4$

$2\pi/3$

$\sec(\pi/3) = \frac{1}{\cos(\pi/3)}$

2

(d) $\sin\left[\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)\right]$ (e) $\cos[\arcsin(-1)]$ (f) $\sin^{-1}\left[\sin\left(\frac{5\pi}{6}\right)\right]$

$\sin\left(-\frac{\pi}{6}\right)$

$\boxed{-\frac{1}{2}}$

$\cos(\pi/2)$

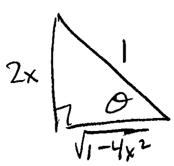
$\boxed{0}$

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

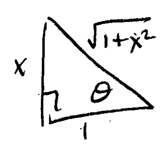
$\boxed{\pi/6}$

4.7 30. Write an algebraic expression equivalent to each expression below. *Hint:* Draw a Δ.

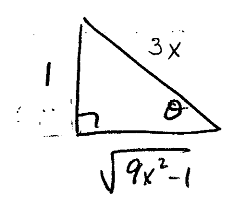
(a) $\tan(\sin^{-1} 2x) = \tan(\theta)$ (b) $\sec(\tan^{-1} x) = \sec(\theta)$ (c) $\cot(\csc^{-1} 3x) = \cot(\theta)$



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



$\boxed{= \sqrt{1+x^2}}$



$\boxed{= \sqrt{9x^2-1}}$

5.1-5.4 Verify that each of the following is an identity. Be sure to show all steps.

31. $\sin^2\theta(\csc^2\theta - 1) + \tan(-\theta)\cos\theta + \cos\left(\frac{\pi}{2} - \theta\right) = \cos^2\theta$

$= \sin^2\theta(\cot^2\theta) - \tan\theta\cos\theta + \sin\theta$

$= \cancel{\sin^2\theta} \cdot \frac{\cos^2\theta}{\cancel{\sin^2\theta}} - \frac{\sin\theta}{\cancel{\cos\theta}} \cdot \cancel{\cos\theta} + \sin\theta$

$= \cos^2\theta - \sin\theta + \sin\theta$

$= \boxed{\cos^2\theta}$

32. $\frac{\sin\beta}{\csc\beta} + \frac{\cos\beta}{\sec\beta} = 1$

$= \frac{\sin\beta}{\frac{1}{\sin\beta}} + \frac{\cos\beta}{\frac{1}{\cos\beta}}$

$= \sin^2\beta + \cos^2\beta$

$= 1$

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

$\frac{2\tan x}{\sec^2 x}$

$2\tan x \div \sec^2 x$

$\frac{2\sin x}{\cos x} \div \frac{1}{\cos^2 x}$

$\frac{2\sin x}{\cancel{\cos x}} \cdot \frac{\cos^{\cancel{2}} x}{1} = 2\sin x\cos x$

$= \sin(2x)$

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

$= \frac{\cos x(1-\sin x) + \cos x(1+\sin x)}{(1+\sin x)(1-\sin x)}$

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

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

$= \frac{2}{\cos x} = 2\sec x$

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

$= \sin(\pi)\cos(x) - \cos(\pi)\sin x$

$= 0 \cdot \cos(x) - (-1)\sin x$

$= \sin x$

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

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

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

5.3-5.4 Rewrite using identities, then simplify if possible.

37. $1-2\sin^2 150°$

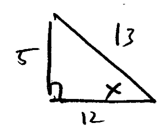
$= \cos(2 \cdot 150)$

$= \boxed{\cos(300°)} = \boxed{\frac{1}{2}}$

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

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

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



$\sin x = +\frac{5}{13}$

$\tan x = -5/12$

(a) $\sin(2x)$

$2\sin x\cos x$

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

$\boxed{-120/169}$

(b) $\tan(2x) = \frac{2\tan x}{1-\tan^2 x}$

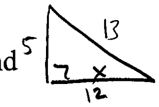
$= \frac{2(-5/12)}{1-(-5/12)^2} = \frac{-5/6}{1-25/144}$

$= -5/6 \div \frac{119}{144}$

$= \frac{-5}{6} \cdot \frac{144}{119}$

$= \boxed{\frac{-120}{119}}$

5.4 40. If $\cot x = -\frac{12}{5}$ and x is in the fourth quadrant, find



$\cos x = \frac{12}{13}$

$\sin x = -5/13$

(a) $\sin(2x)$

$2\sin x\cos x$

$2(-5/13)(12/13)$

$\boxed{-120/169}$

(b) $\cos(2x)$

$\cos^2 x - \sin^2 x$

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

$= \frac{144-25}{169} = \boxed{\frac{119}{169}}$

Ch5 41. Solve each equation for $[0, 2\pi)$.

(a) $2\sin^2 x = \sqrt{3}\sin x$

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

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

$\sin x = 0$ or $\sin x = \sqrt{3}/2$

$\boxed{x = 0, \pi \text{ or } x = \pi/3, 2\pi/3}$

(b) $8\cos^2 x = 4$

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

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

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

(c) $\cos(2x)+\sin(x)=0$

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

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

$0 = (2\sin x + 1)(\sin x - 1)$

$\sin x = -1/2$ or $\sin x = 1$

$\boxed{x = \frac{7\pi}{6}, 11\pi/6 \text{ or } x = \pi/2}$

(d) $\sin(2x)-2\cos(x)=0$

$2\sin x\cos x - 2\cos x = 0$

$2\cos x(\sin x - 1) = 0$

$\cos x = 0$ $\quad$ $\sin x = 1$

$\boxed{x = \frac{\pi}{2}, 3\pi/2 \text{ or } x = \pi/2}$

Ch5 42. Solve for **all** values of x.

(a) $\cos^2 x - 2\sin^2 x + 2 = 0$

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

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

$3 = 3\sin^2 x$

$1 = \sin^2 x$

$\pm 1 = \sin x$

$\boxed{x = \pi/2 + 2\pi \cdot n \quad n = \text{integer}}$

$\boxed{x = 3\pi/2 + 2\pi \cdot n}$

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

$\sin\left(\frac{3\pi}{2}\right)\cos x - \cos\left(3\pi/2\right)\sin x = 1$

$-1 \cdot \cos x - 0 \cdot \sin x = 1$

$\cos x = -1$

$\boxed{x = \pi + 2\pi \cdot n}$

Calculator Allowed

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

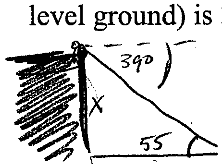
$\frac{55 \text{ mi}}{\text{hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{1 \text{ rev}}{22\pi \text{ in}} \approx$

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

$72 \cdot \frac{\pi}{180} = \frac{2\pi}{5}$ $\quad r = 30$

$s = \frac{2\pi}{5} \cdot 30 = \boxed{12\pi}$

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

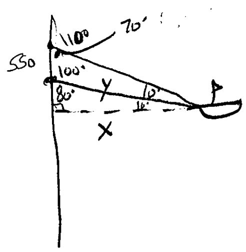


$\tan 39° = \frac{x}{55}$

$55 \tan 39° = x$

$\boxed{x \approx 44.538 \text{ feet}}$

4.6
5.6 46. 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?



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

$y \approx 2976.31077$ } store as A

$\sin 80 = \frac{x}{y} \Rightarrow x = y \cdot \sin 80 \approx \boxed{2931.094}$ feet

5.6 47. Find the area of each triangle.

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

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

$A = \sqrt{16(16-7)(16-12)(16-13)}$

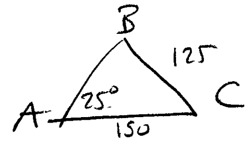
$\boxed{A \approx 41.569}$ units^2

(b) $A = 47°, b = 32, c = 19$

$A = \frac{1}{2}(32)(19)\sin(47°)$

$\boxed{A \approx 222.332}$ units^2

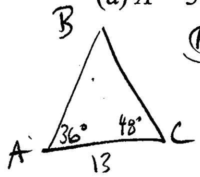
5.5
5.6 48. Solve each triangle. If there are two Δ's, solve both!



"ASS"

D, 1, or 2 Δs?

(a) $A = 36°$, $b = 13$, $C = 48°$



ASA – 1 Δ

$\boxed{\angle B = 96°}$

$\frac{\sin 96}{13} = \frac{\sin 48}{c}$

$\boxed{c \approx 9.714}$

$\frac{\sin 36}{a} = \frac{\sin 96}{13}$

$\boxed{a \approx 7.683}$

(b) $a = 125$, $A = 25°$, $b = 150$

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

$\boxed{B \approx 30.47364409° \quad C \approx 124.5263591°}$ or $\boxed{B \approx 149.5263591° \quad C \approx 5.473640898°}$

$\frac{\sin C}{c} = \frac{\sin 25}{125}$ 1st Δ

$\frac{\sin C}{c} = \frac{\sin 25}{125}$ 2nd Δ

$\boxed{c \approx 243.6789885}$ or $\boxed{c \approx 28.21334757}$

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

SSS

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

$\cos^{-1}\left(\frac{2.3^2 - 1.5^2 - 1.9^2}{-2(1.5)(1.9)}\right) = B$

$\boxed{84.261° \approx B}$

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

$\cos^{-1}\left(\frac{1.9^2 - 1.5^2 - 2.3^2}{-2(1.5)(2.3)}\right) = C$

$\boxed{C \approx 55.280°}$

$\boxed{A \approx 40.459°}$

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

(a) a recursive rule for the nth term.

$\boxed{a_1 = 2 \quad a_n = a_{n-1} \cdot 3 \quad n \geq 2}$

(b) an explicit formula for the nth term.

$\boxed{a_n = 2 \cdot 3^{n-1}}$

9.4 50. Suppose an arithmetic sequence contains $a_{18} = 49$ and $a_{52} = 174.8$. Find …

(a) the common difference 3.7

$49 + d(34) = 174.8$

$34d = 125.8$

$d = 3.7$

(b) a_1 −13.9

$a_1 + 3.7(17) = 49$

$a_1 + 62.9 = 49$

$a_1 = -13.9$

(c) a recursive formula

$\boxed{a_1 = -13.9 \quad a_n = a_{n-1} + 3.7 \quad n \geq 2}$

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

a) the common ratio 4

$128 \cdot r^5 = 131072$

$r^5 = 1024$

$r = 4$

b) a_1 2

$a_1 \cdot r^3 = 128$

$a_1 \cdot 4^3 = 128$

$a_1 = 2$

c) an explicit formula

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

9.4 52. Write each series using sigma notation.

(a) $2 + 5 + 8 + 11 + 14 + \ldots$

$a_1 = 2$

$d = 3$

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

(b) $6 + 2 + \frac{2}{3} + \frac{2}{9} + \ldots + \frac{2}{729}$

$a_1 = 6$

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

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

$6\left(\frac{1}{3}\right)^{n-1} = \frac{2}{729}$

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

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

$7 = n-1$

$8 = n$

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

$? = \frac{(n)(28 + -38)}{2}$

$Sum = \frac{12(28 + -38)}{2} = \boxed{-60}$

$-38 = 28 - 6(n-1)$

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

$+11 = n-1$

$12 = n$

For #54 and #55, tell whether the series converges or diverges. If the series converges, find its sum. If the series diverges, explain why.

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

$|r| = \left|\frac{5}{2}\right| > 1$

Divergent

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

$|r| = \left|-\frac{2}{3}\right| < 1$ Convergent

$Sum = \frac{1/3}{1-(-2/3)} = \frac{1/3}{5/3} = \boxed{\frac{1}{5}}$

9.2 56. Expand:

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

$1x^4(-2)^0 + 4x^3(-2)^1 + 6x^2(-2)^2 + 4x^1(-2)^3 + 1x^0(-2)^4$

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

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

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

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

$10\,(2x)^3(y)^2$

$10\,(2x)^2(y)^3$

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

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

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

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

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

6.1 58. A vector ***u*** has a magnitude of 3.4 cm and a direction of 27°. Write the component form for this vector.

$\langle 3.4\cos 27°, 3.4\sin 27° \rangle$

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

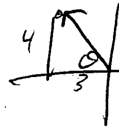
$+6\ -2 \qquad +6\ -2$

$\boxed{\langle 7, -5 \rangle}$ $\qquad |\overrightarrow{AB}| = \sqrt{(7)^2+(-5)^2} = \sqrt{49+25}$

$= \sqrt{74}$

6.1 60. Given $v = \langle -3, 4 \rangle$. Find $|v|$ and give the direction angle in $[0, 360°)$.

$|\vec{v}| = \sqrt{9+16} = \boxed{5}$



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

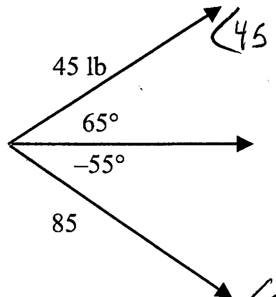
$\theta = \tan^{-1}(4/3)$

$\theta \approx 53.130°$

$\boxed{\text{Direction} = 126.870°}$

6.1 61. 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.

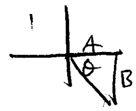
$\langle 45\cos(65°), 45\sin(65°) \rangle$



$\langle 85\cos(-55°), 85\sin(-55°) \rangle$

$\langle \underbrace{45\cos(65°) + 85\cos(-55°)}_{A \approx 67.771\ldots}, \underbrace{45\sin(65°) + 85\sin(-55°)}_{B \approx -28.844\ldots} \rangle$

$\boxed{\text{magnitude}} = \sqrt{A^2+B^2} = \boxed{73.655}$



$\tan\theta = \frac{B}{A}$

$\boxed{\text{Direction}}$

$\theta = \tan^{-1}(B/A) \approx \boxed{-23.055°}$

6.3 62. Eliminate the parameter and identify the graph of the curve.

a) $x = t - 4, y = t^2$

$x+4 = t \qquad y = (x+4)^2$

Parabola

b) $x = 4\sin t, y = 4\cos t$

$\frac{x}{4} = \sin t \qquad \frac{y}{4} = \cos t$

$\sin^2 t + \cos^2 t = 1$

$\frac{x^2}{16} + \frac{y^2}{16} = 1$

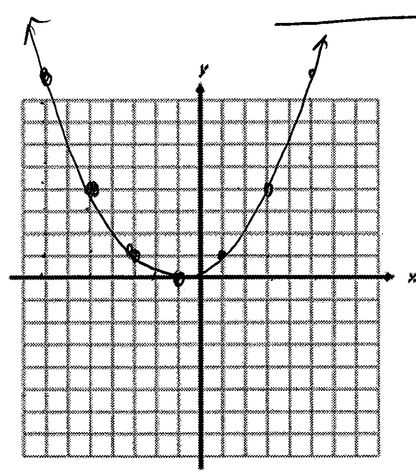
$x^2 + y^2 = 16$

Circle $\quad C(0,0)$

$r = 4$

6.3 63. Create a table of values and the graph of the pair of parametric equations $x = 2t - 1,\ y = t^2$

t	x	y
−3	−7	9
−2	−5	4
−1	−3	1
0	−1	0
1	1	1
2	3	4
3	5	9



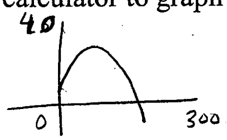
6.3 64. Gretchen Austgen, an outfielder for the West Chicago Wildcats, is 215 feet from home plate after catching a fly ball. The runner tags third and heads for home. Gretchen releases the ball at an initial velocity of 75 ft/s at an angle of 25° with the horizontal. Assume Gretchen releases the ball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



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

HITS ground when $-16t^2 + 75\sin(25°)t + 5 = 0$

$t \approx 2.1278827$ seconds

$\boxed{x(2.1278827) \approx 144.639 \text{ feet}}$

(d) When will the ball hit the ground?

$\boxed{t \approx 2.128 \text{ seconds}}$

(e) What is the maximum height of the trajectory?

graph $y = -16t^2 + 75\sin(25°)t + 5$ in Function mode

CALCULATE MAX = $\boxed{20.69781 \text{ feet}}$

$(.99051094, 20.69781)$

(f) When will the object reach its maximum height?

$\boxed{.99051094 \text{ seconds}}$