

Valley High School
AB Calculus 2018 Summer Work

Attached you will find a variety of review work based on the prerequisites needed for the AB Calculus curriculum. The problems assigned should be the minimum you do to be successful in your next course. It is expected that you understand and can do all the attached. If you don't understand any topic I advise you to go on line to Khan Academy for help. I am also including some extension work for those of you who would like to get a preview of the first chapter in the book.

- Recommended Work:**
1. Complete the Algebra Review
 2. Complete the Trig Review (A-F)/ Trig Formula Sheet

- Extension Work:**
1. Introduction to Calculus: Limits, continuity, and derivatives.
(The topics on these sheets align to section 12.1-12.3 in your Pre-Cal Book)

Algebra Review

To help you prepare for the first semester of Calculus w

1. Quadratic Review
2. Polynomial Review
3. Logarithmic Review
4. Essential Skills Review

The Quadratic Review

Factor:

1. $x^2 + 9x + 20$
2. $9x^2 + 34x - 8$
3. $63x^2 - 175$
4. $4x^2 - 52x + 25$

State the discriminate and describe the nature of the roots:

5. $4x^2 - 12x - 9 = 0$
6. $x^2 + 3x + 9 = 0$

7. Solve by completing the square. $x^2 - 6x + 12 = 0$

Solve by Factoring

8. $5x^2 - 7x - 6 = 0$
9. $9x^2 - 49 = 0$
10. $x^2 - 8x + 7 = 0$

Solve using the quadratic formula.

11. $x^2 - 4x + 10 = 0$
12. $x^2 + 6x + 3 = 0$
13. $2x^2 - 4x = 5$

Place the following quadratic function into vertex form and state the vertex:

14. $y = x^2 - 8x + 1$
15. $y = 3x^2 + 12x - 4$

Graph the following parabolas

16. $y = (x - 4)(x + 2)$
17. $y = -2x^2 - 16x - 13$
18. $y = 2x^2 - 1$

The Polynomial and Quadratic Review

Add/subtract, and or multiply the following

19. $(6x^3 + 22x^2 - 3x - 10) + 4(3x^3 - x + 2)$

20. $(x^3 + 5x^2 - 13x - 7) - 5(3x^2 - x + 2)$

21. $(2x - 3)(2x^2 - 7x + 1)$

Divide the following

22. $(6x^3 + 22x^2 - 3x - 10) \div (3x + 2)$

23. $(2x^4 - 13x^3 + 12x - 5) \div (x + 5)$

Solve. Find all answers, real and imaginary.

24. $16x^3 - 2 = 0$

25. $x^3 - x = 0$

26. $x^4 - 3x^2 - 4 = 0$

27. $625x^4 - 1 = 0$

28. $2x^5 - 18x^3 + 40x = 0$

29. $3x^3 - 2x^2 - 24x + 16 = 0$

Logarithmic Review

Simplify:

30. $32^{-1/5}$

31. $49^{1/2}$

32. $27^{1/3}$

33. $27^{-2/3}$

34. $\left(\frac{1}{8}\right)^{1/3}$

35. $\left(\frac{1}{16}\right)^{-1/4}$

36. $16^{3/4}$

37. $9^{3/2}$

38. $343^{-2/3}$

39. $32^{-2/5}$

Expand and/or Condense – simplify when necessary:

40. $\log\left(\frac{3x^2}{5y^3}\right)$

41. $3\log 2 - \log x - 2\log 7$

42. $3\ln x - \ln 4 - 3\ln y + 3\ln 2$

Evaluate without a calculator:

43. $5\ln e^4$

44. $\log_2 16$

45. $\log_{27} \sqrt{3}$

46. $\log_{\sqrt{3}} \frac{1}{9}$

Solve. No calculator. Check for extraneous solutions.

47. $\log_x \frac{1}{100} = -2$

48. $\log_{\frac{1}{3}} x = 4$

49. $\log_9 \frac{1}{81} = x$

50. $2^{2x-1} = \left(\frac{1}{4}\right)^{x+2}$

51. $\log_5(5x-3) = \log_5(x+11)$

52. $\log_4(13x+12) - \log_4(x-8) = 2$

Algebra 2 Essential Skills Review

Drawings are not to scale. The graded mastery quiz will only include one of each type of question, additional problems are provided to give a sense of the variations each question might contain.

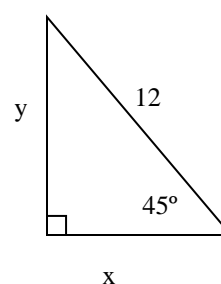
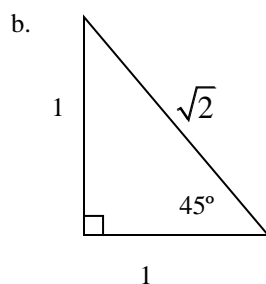
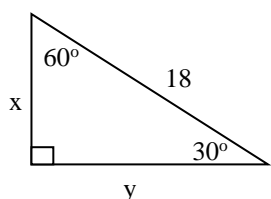
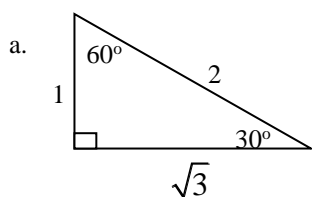
1. (Geo. St. 17) Calculate the midpoint of and distance between points A(4, 3) and B(7, -9).

2. (Alg. 2 St. 25) Evaluate the following for the given functions .

a. $f(x) = 3x + 4$, find $f(a+4)$

b. $f(x) = 3x^2 + 4x - 2$, find $f(5-w)$.

3. (Geo. St. 20) Use special right triangles to find the exact value of x and y for the given triangles.



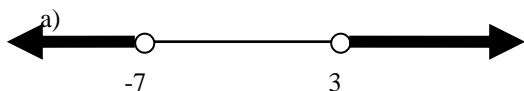
4. (Alg. St. 7&8) Find the equation of the line which passes through the point (3, -1) and is perpendicular to the line determined by $y = -\frac{1}{4}x + 7$. Write your answer in both point-slope form and slope-intercept form.

5. (Alg. St. 9) Solve the following systems of equations algebraically.

a)
$$\begin{aligned} 5c + 6d &= 14 \\ 3c - 4d &= 16 \end{aligned}$$

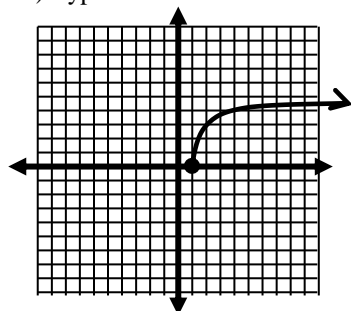
b)
$$\begin{aligned} 3x + 5y &= 12 \\ x - 2y &= 9 \end{aligned}$$

6. (Alg. 2 St. 1) Write the Absolute Value Inequality that represents the given graphical solution.

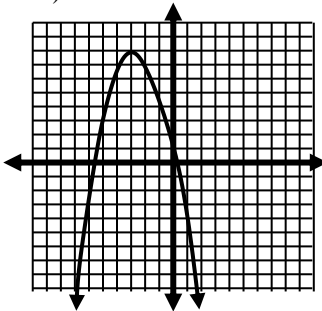


7. (Alg. St. 17) Answer the following for the given graphs:

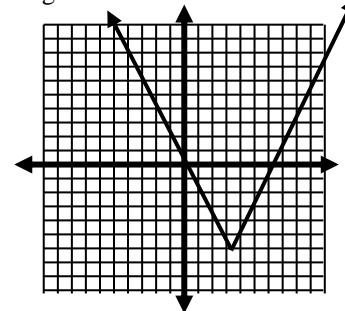
a) Type of function/relation



b) Domain.



c) Range.



8. (Alg. 2 St. 8) Find the roots of the following equations over the complex numbers.

a) $x^4 + x^2 - 20 = 0$

b) $4x^3 + 12x^2 - 9x - 27 = 0$

c) $x - \sqrt{x} - 6 = 0$

9. (Alg. 2 St. 6) Simplify each expression

a) $\frac{5}{\sqrt{3}+7}$

b) $\frac{4+3i}{7-7i}$

10. (Alg. 2 St. 24) Given $f(x) = x^2 - 7x + 12$ and $g(x) = x + 2$, find $f(g(x))$ and $(g \circ f)(x)$.

11. (Alg. 2 St. 24) Find the inverse of each function listed below.

a) $f(x) = 3x + 7$

b) $g(x) = x^3 - 8$

c) $h(x) = x^2 + 2x - 8$

12. (Alg. 2 St. 7) Simplify the following expressions, recall there are to be no negative exponents in final answer.

a) $(2x^2y^{-4})^2(2xy^3)^{-3}$

b) $\left(\frac{32x^4y^2}{6y^{-3}x^7}\right)^{-3}$

Problems 13-15 are Graphing Calculator Problems

13. (Alg. 2 St. 3) For the following find the zeros, max/min, the regions where $f(x)$ is increasing and decreasing, and the regions where $f(x)$ is positive and negative

a) $y = x^4 - 6x^2 - 8x - 3$

14. (Alg. St. 2) Solve for x algebraically or graphically.

a) $x^3 - 6x = |2x|$

b) $y = x^2 - 4x + 4$
 $y = (x + 2)^{2/3}$

15. (Alg. 2 St. 8) Complete the square and answer the following for the given quadratic.

a. Write in vertex form.

b. max/min

c. find zeros in exact form

a) $y = 2x^2 - 16x + 33$

b) $y = x^2 + 8x - 5$

Answers to Review problems

The Quadratic Review

1. $(x+4)(x+5)$ 2. $(x+4)(9x-2)$ 3. $7(3x+5)(3x-5)$ 4. $(2x-1)(2x-25)$

State the discriminant and describe the nature of the roots:

5. $D > 0$, 2 real roots

6. $D < 0$, 2 imaginary roots

7. Solve by completing the square. $x = 3 \pm i\sqrt{3}$

Solve by Factoring 8. $x = -\frac{3}{5}, 2$ 9. $x = \pm \frac{7}{3}$ 10. $x = 7, 1$

Solve using the quadratic formula. 11. $x = 2 \pm i\sqrt{6}$ 12. $x = -3 \pm \sqrt{6}$ 13. $x = \frac{2 \pm \sqrt{14}}{2}$

Place the following quadratic function into vertex form and state the vertex:

14. $y = (x-4)^2 - 15$, V:(4,-15)

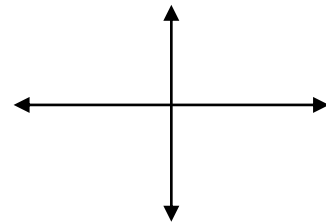
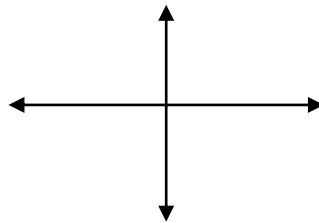
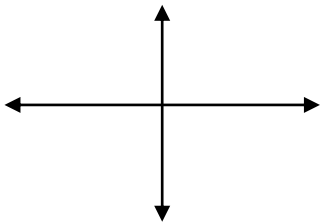
15. $y = 3(x+2)^2 - 16$, V:(-2,-16)

Graph the following parabolas

16. $y = (x-4)(x+2)$
 $y = (x-1)^2 - 9$

17. $y = -2x^2 - 16x - 13$
 $y = -2(x+4)^2 + 19$

18. $y = 2x^2 - 1$



The Polynomial and Quadratic Review

Add/subtract, and or multiply the following

19. $18x^3 + 22x^2 - 7x - 2$

20. $x^3 - 10x^2 - 8x - 17$

21. $4x^3 - 20x^2 + 23x - 3$

Divide the following

22. $2x^2 + 6x - 5$

23. $2x^3 - 23x^2 + 115x - 563 + \frac{2810}{x+5}$

Solve. Find all answers, real and imaginary.

24. $x = \frac{-1 \pm i\sqrt{3}}{4}, \frac{1}{2}$

25. $x = 0, \pm 1$

26. $x = \pm i, \pm 2$

27. $x = \pm \frac{1}{5}i, \pm \frac{1}{5}$

28. $x = \pm i\sqrt{5}, \pm 2, 0$

29. $x = \pm 2\sqrt{2}, \frac{2}{3}$

Logarithmic Review

30. $\frac{1}{2}$ 31. 7 32. 3 33. $\frac{1}{9}$ 34. $\frac{1}{2}$ 35. 2 36. 8
37. 27 38. $\frac{1}{49}$ 39. $\frac{1}{4}$ 40. $\log 3 + 2\log x - \log 5 - 3\log y$ 41. $\log\left(\frac{8}{49x}\right)$
42. $\ln\left(\frac{2x^3}{y^3}\right)$ 43. 20 44. 4 45. $\frac{1}{6}$ 46. -4 47. 10 48. $\frac{1}{81}$
49. -2 50. $\frac{-3}{4}$ 51. $\frac{7}{2}$ 52. $\frac{140}{3}$

Algebra 2 Review **SAMPLE MASTERY QUIZ**

1. $\sqrt{153}$ $\left(\frac{11}{2}, -3\right)$ 2. a. $3a+16$ b. $3w^2-34w+93$

3. a. $x=9$ $y=9\sqrt{3}$ b. $x=y=6\sqrt{2}$ 4. $y+1=4(x-3)$, $y=4x-13$

5. a. (4,-1) b. $\left(\frac{69}{11}, \frac{-15}{11}\right)$ 6. a. $|x+2|>5$ b. $\left|x+\frac{9}{2}\right|\leq 3$

7.

- | | | |
|------------------------|------------------------------|------------------------------|
| i) a) Radical | ii) a) Quadratic | iii) a) Absolute Value |
| b) $x \in [1, \infty)$ | b) $x \in (-\infty, \infty)$ | b) $x \in (-\infty, \infty)$ |
| c) $y \in [0, \infty)$ | c) $y \in (-\infty, 8]$ | c) $y \in [-6, \infty)$ |

8. a) $x = \pm i\sqrt{5}, \pm 2$ b) $x = \pm \frac{3}{2}, -3$ c) $x = 9$

9. a) $\frac{5\sqrt{3}-35}{-46}$ b) $\frac{1+7i}{14}$

10. $f(g(x)) = x^2 - 3x + 2$ and $(g \circ f)(x) = x^2 - 7x + 14$

11. a) $f^{-1}(x) = \frac{x-7}{3}$ b) $g^{-1}(x) = (x+8)^{1/3}$ c) $h^{-1}(x) = -1 \pm \sqrt{x+9}$

12. a) $\frac{x}{2y^{17}}$ b) $\frac{27x^9}{4096x^{15}}$

Honors Precalculus
Trigonometry Review: A to F

Name _____
Date _____ Per. _____

1. Sketch the following in standard position and find their complimentary and supplementary angles:

a. $\theta = 87^\circ$

b. $\beta = \frac{2\pi}{5}$

c. $\alpha = 128^\circ$

2. Sketch the following in standard position and find a positive and negative co-terminal angle:

a. $\theta = \frac{13\pi}{9}$

b. $\beta = -234^\circ$

c. $\alpha = \frac{5\pi}{8}$

3. Sketch the following in standard position and find their reference angles:

a. $\theta = \frac{3\pi}{10}$

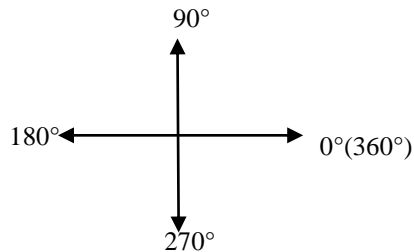
b. $\beta = 333^\circ$

c. $\alpha = -222^\circ$

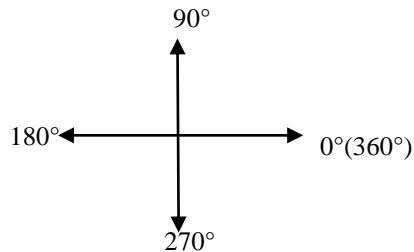
d. $\alpha = -\frac{11\pi}{12}$

For each of the given trigonometric functions: draw the angle, list the reference angle, and find the desired ratio.

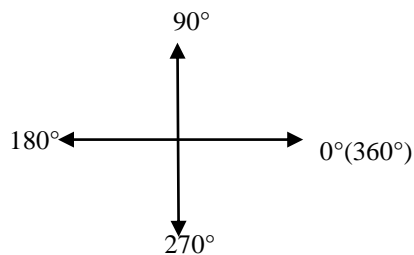
4. $\sin 240^\circ = \underline{\hspace{1cm}}$ ref. angle: $\underline{\hspace{1cm}}$



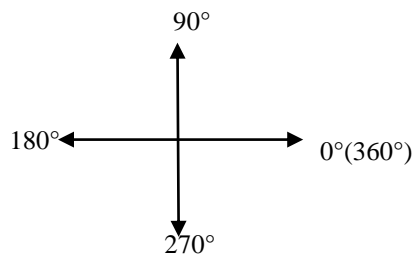
5. $\cos 150^\circ = \underline{\hspace{1cm}}$ ref. angle: $\underline{\hspace{1cm}}$



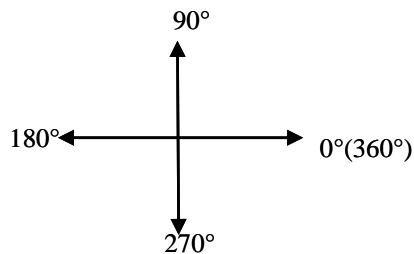
6. $\tan 225^\circ = \underline{\hspace{1cm}}$ ref. angle: $\underline{\hspace{1cm}}$



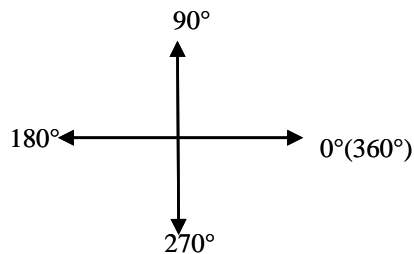
7. $\tan 600^\circ = \underline{\hspace{1cm}}$ ref. angle: $\underline{\hspace{1cm}}$



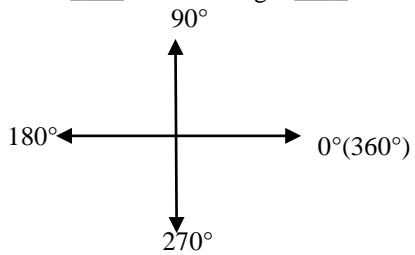
8. $\cos 315^\circ = \underline{\hspace{1cm}}$ ref. angle: $\underline{\hspace{1cm}}$



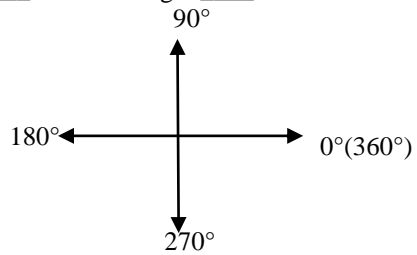
9. $\sin 405^\circ = \underline{\hspace{1cm}}$ ref. angle: $\underline{\hspace{1cm}}$



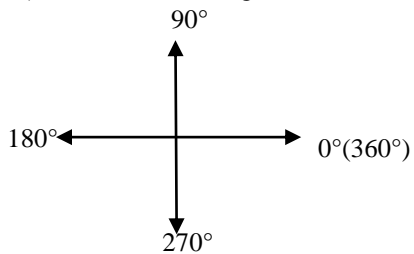
10. $\csc 330^\circ = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



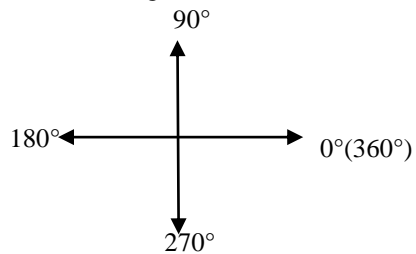
11. $\cot 240^\circ = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



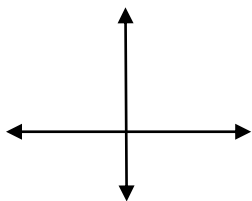
12. $\sec(-120^\circ) = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



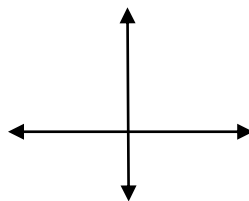
13. $\cot(-225^\circ) = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



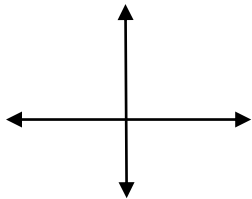
14. $\sin \frac{11\pi}{6} = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



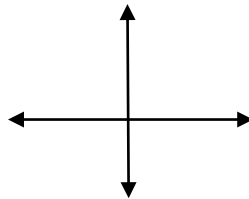
15. $\cos \frac{5\pi}{4} = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



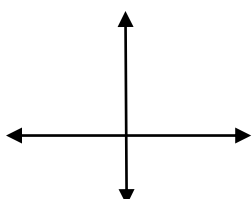
16. $\tan \frac{4\pi}{3} = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



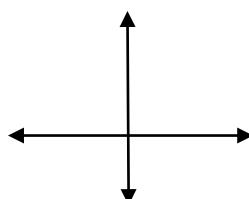
17. $\tan \frac{7\pi}{4} = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



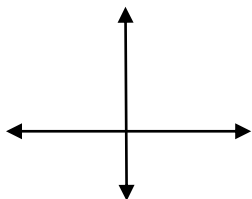
18. $\cot \frac{3\pi}{4} = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



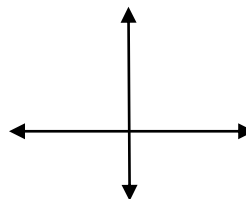
19. $\sec \frac{5\pi}{3} = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



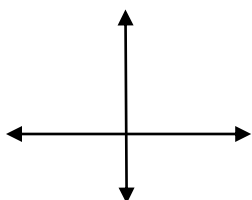
20. $\sin\left(-\frac{\pi}{6}\right) = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



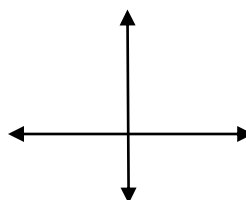
21. $\cos\left(-\frac{5\pi}{4}\right) = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



22. $\tan\frac{17\pi}{6} = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



23. $\csc\frac{15\pi}{4} = \underline{\hspace{2cm}}$ ref. angle: $\underline{\hspace{2cm}}$



Given the following information, determine the quadrantal angle in both radians and degrees.

| | |
|--|--|
| <p>24. $\cos\theta = 0$ and $\sin\theta = 1$</p> <p>$\theta = \underline{\hspace{2cm}}$ or $\underline{\hspace{2cm}}$</p> | <p>25. $\tan\theta = 0$ and $\cos\theta = -1$</p> <p>$\theta = \underline{\hspace{2cm}}$ or $\underline{\hspace{2cm}}$</p> |
| <p>26. $\tan\theta$ is undefined, and $\sin\theta = -1$</p> <p>$\theta = \underline{\hspace{2cm}}$ or $\underline{\hspace{2cm}}$</p> | <p>27. $\sin\theta = 0$ and $\cos\theta \geq 0$</p> <p>$\theta = \underline{\hspace{2cm}}$ or $\underline{\hspace{2cm}}$</p> |
| <p>28. $\cos\theta = 0$ and $\csc\theta = -1$</p> <p>$\theta = \underline{\hspace{2cm}}$ or $\underline{\hspace{2cm}}$</p> | <p>29. $\tan\theta = 0$ and $\sec\theta = 1$</p> <p>$\theta = \underline{\hspace{2cm}}$ or $\underline{\hspace{2cm}}$</p> |

Find the values of the six trigonometric function of θ .

30. $\cos\theta = -\frac{4}{5}$ in QIII

31. $\tan\theta = -\frac{15}{8}$ and $\sin\theta < 0$

32. $\csc\theta = 4$ and $\cot\theta < 0$

33. $\sec\theta = \frac{5}{3}$ and $\csc\theta < 0$

34. $\sin\theta = x$ in QI

For each of the following trigonometric ratios and quadrants determine the reference angle (in radians) that would give that ratio and the actual value of θ (in radians).

35. $\sin \theta = \frac{\sqrt{3}}{2}$ in QII.

ref. angle: _____ $\theta =$ _____

36. $\cos \theta = \frac{\sqrt{2}}{2}$ in QI

ref. angle: _____ $\theta =$ _____

37. $\tan \theta = \frac{1}{\sqrt{3}}$ in QIII.

ref. angle: _____ $\theta =$ _____

38. $\cos \theta = \frac{-\sqrt{3}}{2}$ in QII

ref. angle: _____ $\theta =$ _____

39. $\tan \theta = -\sqrt{3}$ in QIV.

ref. angle: _____ $\theta =$ _____

40. $\cot \theta = \frac{-\sqrt{3}}{3}$ in QIV.

ref. angle: _____ $\theta =$ _____

41. $\cos \theta = -\frac{1}{2}$ in QIII

ref. angle: _____ $\theta =$ _____

42. $\csc \theta = 2$ in QI

ref. angle: _____ $\theta =$ _____

For each of the following trigonometric ratios and quadrants determine the reference angle (in degrees) that would give that ratio and the actual value of θ (in degrees).

43. $\cos \theta = -\frac{\sqrt{2}}{2}$ in QIII

ref. angle: _____ $\theta =$ _____

44. $\cos \theta = \frac{\sqrt{3}}{2}$ in QI

ref. angle: _____ $\theta =$ _____

45. $\tan \theta = \sqrt{3}$ in QIII.

ref. angle: _____ $\theta =$ _____

46. $\cos \theta = \frac{-1}{2}$ in QII

ref. angle: _____ $\theta =$ _____

47. $\tan \theta = -1$ in QIV.

ref. angle: _____ $\theta =$ _____

48. $\sin \theta = -\frac{1}{2}$ in QIV

ref. angle: _____ $\theta =$ _____

49. $\csc \theta = \sqrt{2}$ in QI.

ref. angle: _____ $\theta =$ _____

50. $\cot \theta = \frac{-\sqrt{3}}{3}$ in QIV.

ref. angle: _____ $\theta =$ _____

Reciprocal Identities: The following Trig identities are true for all values of θ , except those for which the function is undefined:

$$\sin \theta =$$

$$\csc \theta =$$

$$\cos \theta =$$

$$\sec \theta =$$

$$\tan \theta =$$

$$\cot \theta =$$

Quotient Identities: The following Trig identities are true for all values of θ , except those for which the function is undefined:

$$\tan \theta =$$

$$\cot \theta =$$

Co-function Identities: The following Trig identities are true for all values of θ , except those for which the function is undefined:

$$\sin\left(\frac{\pi}{2} - \theta\right) =$$

$$\text{and } \tan\left(\frac{\pi}{2} - \theta\right) =$$

$$\text{and } \sec\left(\frac{\pi}{2} - \theta\right) =$$

$$\cos\left(\frac{\pi}{2} - \theta\right) =$$

$$\text{and } \cot\left(\frac{\pi}{2} - \theta\right) =$$

$$\text{and } \csc\left(\frac{\pi}{2} - \theta\right) =$$

Even and Odd Identities: The following Trig identities are true for all values of θ , except those for which the function is undefined:

$$\sin(-\theta) =$$

$$\cos(-\theta) =$$

$$\tan(-\theta) =$$

Pythagorean Identities: The following Trig identities are true for all values of θ , except those for which the function is undefined:

1.

$$\text{or } \sin^2 \theta =$$

$$\text{or } \cos^2 \theta =$$

2.

$$\text{or } \tan^2 \theta =$$

3.

$$\text{or } \cot^2 \theta =$$

Sum & Difference Identities:

$$\cos(\alpha - \beta) =$$

$$\cos(\alpha + \beta) =$$

$$\sin(\alpha - \beta) =$$

$$\sin(\alpha + \beta) =$$

$$\tan(\alpha + \beta) =$$

$$\tan(\alpha - \beta) =$$

The Double Angle Identities:

$$\sin 2\theta =$$

$$\tan 2\theta =$$

$$\cos 2\theta =$$

or

$$\cos 2\theta =$$

or

$$\cos 2\theta =$$

Half Angle Identities:

$$\cos\left(\frac{\theta}{2}\right) =$$

$$\sin\left(\frac{\theta}{2}\right) =$$

$$\tan\left(\frac{\theta}{2}\right) =$$

or

$$\tan\left(\frac{\theta}{2}\right) =$$

Power Reducing Identities:

$$\cos^2(\theta) =$$

$$\sin^2(\theta) =$$

$$\tan^2(\theta) =$$

Product-to-Sum Identities:

$$\sin u \sin v = \frac{1}{2} [\cos(u - v) - \cos(u + v)]$$

$$\cos u \cos v = \frac{1}{2} [\cos(u - v) + \cos(u + v)]$$

$$\sin u \cos v = \frac{1}{2} [\sin(u + v) + \sin(u - v)]$$

$$\cos u \sin v = \frac{1}{2} [\sin(u + v) - \sin(u - v)]$$

Sum-to-Product Identities:

$$\sin x + \sin y = 2 \sin\left(\frac{x + y}{2}\right) \cos\left(\frac{x - y}{2}\right)$$

$$\sin x - \sin y = 2 \cos\left(\frac{x + y}{2}\right) \sin\left(\frac{x - y}{2}\right)$$

$$\cos x + \cos y = 2 \cos\left(\frac{x + y}{2}\right) \cos\left(\frac{x - y}{2}\right)$$

$$\cos x - \cos y = -2 \sin\left(\frac{x + y}{2}\right) \sin\left(\frac{x - y}{2}\right)$$