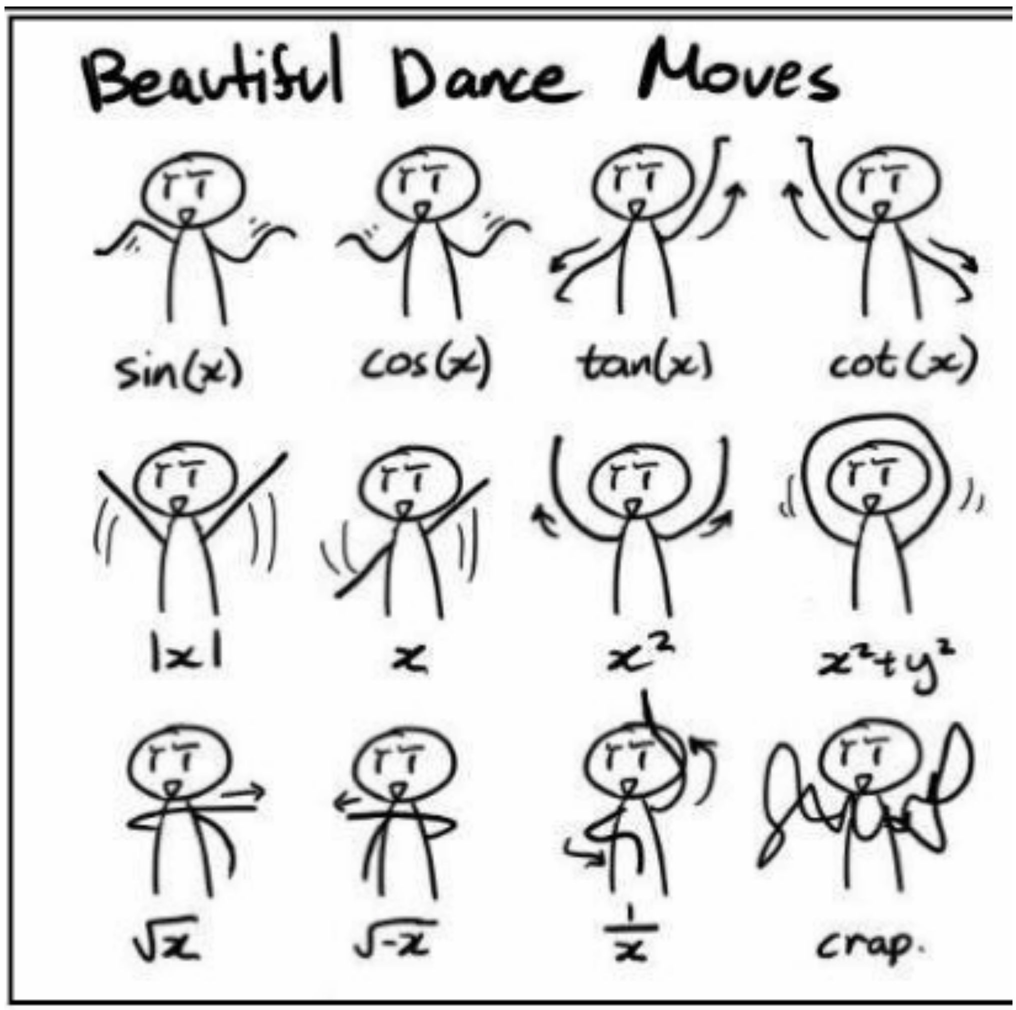
Name: ____

AP Calculus Summer Review Assignment

1. This packet is to be handed in to your Calculus teacher on the first day of the school year.
2. All work must be shown in the packet OR on separate paper attached to the packet.



Dear Student and Parent/Guardian,

The math department at Northeast High School wants you to be successful in AP Calculus. This summer packet is designed to help you reach these goals by reviewing necessary skills.

Be sure to follow the key information below when completing this packet:

•The packet is due when you return to school in August.
•Every problem must be completed. None left blank.
•The packet will be collected and graded on the first day of class—no excuses. Work must be shown to receive credit – no work, no points. Final answers must be circled.
•You MUST have the unit circle and the chart memorized. There will be a test on the first day of class.

Use any resources available to you: Internet, Text Books, etc.

We hope that you have an enjoyable summer and return to school ready to be successful in AP Calculus!

Sincerely,
Dr. Duszynski
Duszynskili@pcsb.org

Helpful Websites
www.glencoe.com
www.wolframalpha.com
www.purplemath.com/modules
www.khanacademy.org
apcentral.collegeboard.org

Formula Sheet

Reciprocal Identities: $\csc x = \dfrac{1}{\sin x}$ $\sec x = \dfrac{1}{\cos x}$ $\cot x = \dfrac{1}{\tan x}$

Quotient Identities: $\tan x = \dfrac{\sin x}{\cos x}$ $\cot x = \dfrac{\cos x}{\sin x}$

Pythagorean Identities: $\sin^2 x + \cos^2 x = 1$ $\tan^2 x + 1 = \sec^2 x$ $1 + \cot^2 x = \csc^2 x$

Double Angle Identities: $\sin 2x = 2\sin x \cos x$ $\tan 2x = \dfrac{2\tan x}{1 - \tan^2 x}$

$$\begin{aligned}\cos 2x &= \cos^2 x - \sin^2 x \\ &= 1 - 2\sin^2 x \\ &= 2\cos^2 x - 1\end{aligned}$$

Logarithms:
$y = \log_a x$ is equivalent to $x = a^y$

Product property: $\log_b mn = \log_b m + \log_b n$

Quotient property: $\log_b \dfrac{m}{n} = \log_b m - \log_b n$

Power property: $\log_b m^p = p \log_b m$

Property of equality: If $\log_b m = \log_b n$,
then m = n

Change of base formula: $\log_a n = \dfrac{\log_b n}{\log_b a}$

Fractional exponent: $\sqrt[b]{x^e} = x^{\frac{e}{b}}$

Negative Exponents: $x^{-n} = 1/x^n$

The Zero Exponent: $x^0=1$, for x not equal to 0.

Multiplying Powers

Multiplying Two Powers of the Same Base:
$(x^a)(x^b) = x^{(a+b)}$

Multiplying Powers of Different Bases:
$(xy)^a = (x^a)(y^a)$

Dividing Powers

Dividing Two Powers of the Same Base:
$(x^a)/(x^b) = x^{(a-b)}$

Dividing Powers of Different Bases:
$(x/y)^a = (x^a)/(y^a)$

Slope-intercept form: $y = mx + b$

Point-slope form: $y = m(x - x_1) + y_1$

Standard form: Ax + By + C = 0

Complex Fractions

When simplifying complex fractions, multiply by a fraction equal to 1 which has a numerator and denominator composed of the common denominator of all the denominators in the complex fraction.

Example:

$$\frac{-7-\frac{6}{x+1}}{\frac{5}{x+1}} = \frac{-7-\frac{6}{x+1}}{\frac{5}{x+1}} \bullet \frac{x+1}{x+1} = \frac{-7x-7-6}{5} = \frac{-7x-13}{5}$$

$$\frac{\frac{-2}{x}+\frac{3x}{x-4}}{5-\frac{1}{x-4}} = \frac{\frac{-2}{x}+\frac{3x}{x-4}}{5-\frac{1}{x-4}} \bullet \frac{x(x-4)}{x(x-4)} = \frac{-2(x-4)+3x(x)}{5(x)(x-4)-1(x)} = \frac{-2x+8+3x^2}{5x^2-20x-x} = \frac{3x^2-2x+8}{5x^2-21x}$$

Simplify each of the following.

1. $\dfrac{\frac{25}{a}-a}{5+a}$

2. $\dfrac{2-\frac{4}{x+2}}{5+\frac{10}{x+2}}$

3. $\dfrac{4-\frac{12}{2x-3}}{5+\frac{15}{2x-3}}$

4. $\dfrac{\frac{x}{x+1}-\frac{1}{x}}{\frac{x}{x+1}+\frac{1}{x}}$

5. $\dfrac{1-\frac{2x}{3x-4}}{x+\frac{32}{3x-4}}$

Function

To evaluate a function for a given value, simply plug the value into the function for x.

Recall: $(f \circ g)(x) = f(g(x))$ *OR* $f[g(x)]$ read "***f*** of ***g*** of ***x***" Means to plug the inside function (in this case g(x)) in for x in the outside function (in this case, f(x)).

Example: Given $f(x) = 2x^2 + 1$ *and* $g(x) = x - 4$ find *f(g(x))*.

$$
\begin{aligned}
f(g(x)) &= f(x-4) \\
&= 2(x-4)^2 + 1 \\
&= 2(x^2 - 8x + 16) + 1 \\
&= 2x^2 - 16x + 32 + 1 \\
f(g(x)) &= 2x^2 - 16x + 33
\end{aligned}
$$

Let $f(x) = 2x + 1$ *and* $g(x) = 2x^2 - 1$. **Find each.**

6. $f(\text{g(x)}) =$ ____________

7. $g(\text{f(x)}) =$ ______________

8. $f(t+1) =$ __________

9. $f\left[g(-2)\right] =$__________

10. $g\left[f(m+2)\right] =$___________

11. $\dfrac{f(x+h) - f(x)}{h} =$______

Let $f(x) = \sin x$ **Find each exactly.**

12. $f\left(\dfrac{\pi}{2}\right) =$___________

13. $f\left(\dfrac{2\pi}{3}\right) =$______________

Find $\frac{f(x+h)-f(x)}{h}$ **for the given function *f*.**

14. $f(x)=9x+3$

15. $f(x)=5-2x$

Intercepts and Points of Intersection

To find the x-intercepts, let y = 0 in your equation and solve.
To find the y-intercepts, let x = 0 in your equation and solve.

Example: $y=x^2-2x-3$

$\underline{x-\text{int}.\ (Let\ y=0)}$	$\underline{y-\text{int}.\ (Let\ x=0)}$
$0=x^2-2x-3$	$y=0^2-2(0)-3$
$0=(x-3)(x+1)$	$y=-3$
$x=-1\ or\ x=3$	$y-\text{intercept}\ (0,-3)$
$x-\text{intercepts}\ (-1,0)\ and\ (3,0)$	

Find the x and y intercepts for each.

16. $y=2x-5$

17. $y=x^2+x-2$

18. $y=x\sqrt{16-x^2}$

19. $y^2=x^3-4x$

Systems

Use substitution or elimination method to solve the system of equations.
Example:

$x^2 + y - 16x + 39 = 0$

$x^2 - y^2 - 9 = 0$

Elimination Method

$2x^2 - 16x + 30 = 0$

$x^2 - 8x + 15 = 0$

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

$x = 3 \textit{ and } x = 5$

Plug $\mathrm{x}=3 \textit{ and } x = 5$ into one original

$3^2 - y^2 - 9 = 0 \qquad 5^2 - y^2 - 9 = 0$

$-y^2 = 0 \qquad 16 = y^2$

$y = 0 \qquad y = \pm 4$

Points of Intersection $(5,4), (5,-4) \textit{ and } (3,0)$

Substitution Method

Solve one equation for one variable.

$y^2 = -x^2 + 16x - 39$ (1st equation solved for y)

$x^2 - (-x^2 + 16x - 39) - 9 = 0$ Plug what y^2 is equal to into second equation.

$2x^2 - 16x + 30 = 0$ (*The rest is the same as*

$x^2 - 8x + 15 = 0$ *previous example*)

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

$x = 3 \textit{ or } x - 5$

Find the point(s) of intersection of the graphs for the given equations.

20. $x + y = 8$
$4x - y = 7$

21. $x^2 + y = 6$
$x + y = 4$

Domain and Range

Find the domain and range of each function. Write your answer in INTERVAL notation.

22. $f(x) = x^2 - 5$

23. $f(x) = -\sqrt{x+3}$

24. $f(x) = 3\sin x$

25. $f(x) = \dfrac{2}{x-1}$

Inverses

To find the inverse of a function, simply switch the x and the y and solve for the new "y" value.
Example:

$f(x) = \sqrt[3]{x+1}$	Rewrite f(x) as y
$y = \sqrt[3]{x+1}$	Switch x and y
$x = \sqrt[3]{y+1}$	Solve for your new y
$(x)^3 = \left(\sqrt[3]{y+1}\right)^3$	Cube both sides
$x^3 = y+1$	Simplify
$y = x^3 - 1$	Solve for y
$f^{-1}(x) = x^3 - 1$	Rewrite in inverse notation

Find the inverse for each function.

26. $f(x) = 2x + 1$

27. $f(x) = \dfrac{x^2}{3}$

Equation of a line

Slope intercept form: $y = mx + b$

Vertical line: x = c (slope is undefined)

Point-slope form: $y - y_1 = m(x - x_1)$

Horizontal line: y = c (slope is 0)

28. Use slope-intercept form to find the equation of the line having a slope of 3 and a y-intercept of 5.

29. Determine the equation of a line passing through the point (5, -3) with an undefined slope.

30. Determine the equation of a line passing through the point (-4, 2) with a slope of 0.

31. Use point-slope form to find the equation of the line passing through the point (0, 5) with a slope of 2/3.

32. Find the equation of a line passing through the point (2, 8) and parallel to the line $y = \frac{5}{6}x - 1$.

33. Find the equation of a line perpendicular to the y- axis passing through the point (4, 7).

34. Find the equation of a line passing through the points (-3, 6) and (1, 2).

35. Find the equation of a line with an x-intercept (2, 0) and a y-intercept (0, 3).

Radian and Degree Measure

Use $\frac{180^\circ}{\pi\, radians}$ to get rid of radians and convert to degrees.	Use $\frac{\pi\, radians}{180^\circ}$ to get rid of degrees and convert to radians.

36. Convert to degrees: a. $\frac{5\pi}{6}$ b. $\frac{4\pi}{5}$ c. 2.63 radians

37. Convert to radians: a. 45° b. -17° c. 237°

Angles in Standard Position

38. Sketch the angle in standard position.

a. $\frac{11\pi}{6}$ b. 230° c. $-\frac{5\pi}{3}$ d. 1.8 radians

Reference Triangles

39. Sketch the angle in standard position. Draw the reference triangle and label the sides, if possible.

a. $\frac{2}{3}\pi$

b. 225°

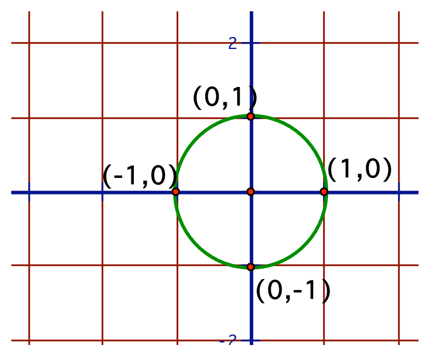
c. $-\frac{\pi}{4}$

d. 30°

Unit Circle

You can determine the sine or cosine of a quadrantal angle by using the unit circle. The x-coordinate of the circle is the cosine and the y-coordinate is the sine of the angle.

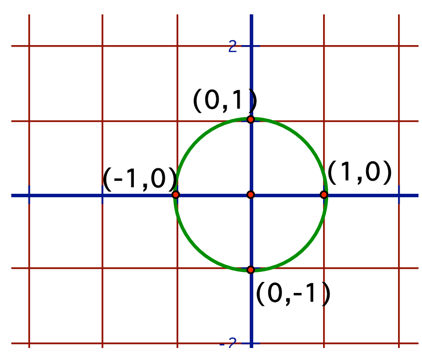
Example: $\sin 90^\circ = 1$ $\qquad$ $\cos\frac{\pi}{2} = 0$



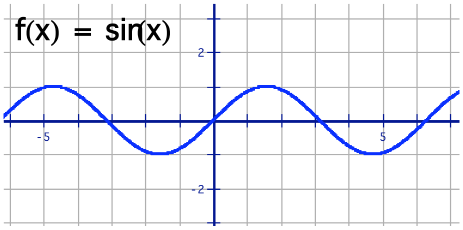
40. $a.)\ \sin 180^\circ$ $\qquad$ $b.)\ \cos 270^\circ$

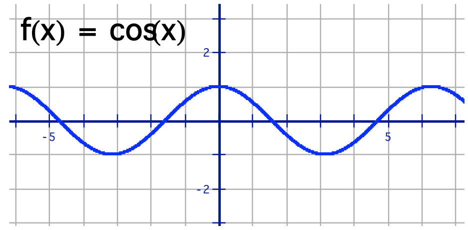
$c.)\ \sin(-90^\circ)$ $\qquad$ $d.)\ \sin\pi$

$e.)\ \cos 360^\circ$ $\qquad$ $f.)\ \cos(-\pi)$



Graphing Trig Functions





y = sin x and y = cos x have a period of 2π and an amplitude of 1. Use the parent graphs above to help you sketch a graph of the functions below. For $f(x) = A\sin(Bx + C) + K$, A = amplitude, $\frac{2\pi}{B}$ = period, $\frac{C}{B}$ = phase shift (positive C/B shift left, negative C/B shift right) and K = vertical shift.

Graph two complete periods of the function.

41. $f(x) = 5\sin x$

42. $f(x) = \sin 2x$

43. $f(x) = -\cos\left(x - \frac{\pi}{4}\right)$

44. $f(x) = \cos x - 3$

Trigonometric Equations:

Solve each of the equations for $0 \le x < 2\pi$. Isolate the variable, sketch a reference triangle, find all the solutions within the given domain, $0 \le x < 2\pi$. Remember to double the domain when solving for a double angle. Use trig identities, if needed, to rewrite the trig functions. (See formula sheet at the beginning of the packet.)

45. $\sin x = -\frac{1}{2}$

46. $2\cos x = \sqrt{3}$

47. $\cos 2x = \frac{1}{\sqrt{2}}$

48. $\sin^2 x = \frac{1}{2}$

49. $\sin 2x = -\frac{\sqrt{3}}{2}$

50. $2\cos^2 x - 1 - \cos x = 0$

51. $4\cos^2 x - 3 = 0$

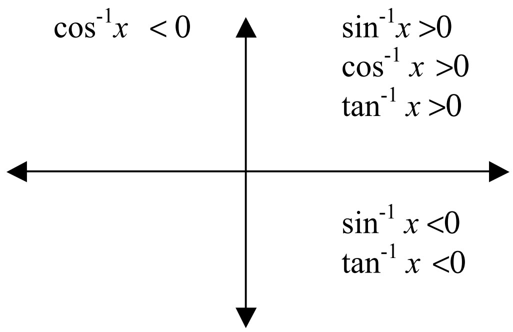
52. $\sin^2 x + \cos 2x - \cos x = 0$

<u>Inverse Trigonometric Functions:</u>

Recall: Inverse Trig Functions can be written in one of ways:

$$\arcsin(x) \qquad\qquad \sin^{-1}(x)$$

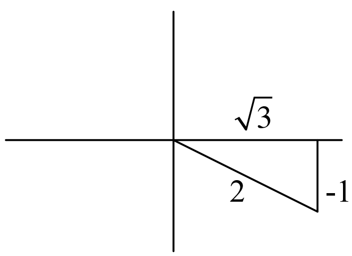
Inverse trig functions are defined only in the quadrants as indicated below due to their restricted domains.



Example:

Express the value of "y" in radians.

$y = \arctan\dfrac{-1}{\sqrt{3}}$ Draw a reference triangle.



This means the reference angle is 30° or $\dfrac{\pi}{6}$. So, y = $-\dfrac{\pi}{6}$ so that it falls in the interval from

$$\frac{-\pi}{2} < y < \frac{\pi}{2} \qquad\qquad \text{Answer: } y = -\frac{\pi}{6}$$

For each of the following, express the value for "y" in radians.

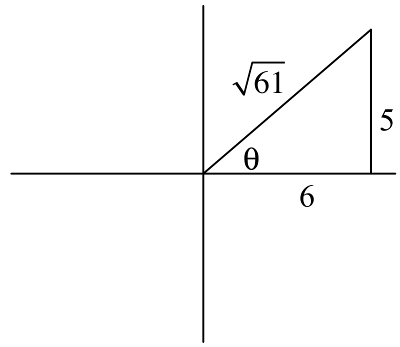
53. $y = \arcsin\dfrac{-\sqrt{3}}{2}$

54. $y = \arccos(-1)$

55. $y = \arctan(-1)$

Example: Find the value without a calculator.

$$\cos\left(\arctan\frac{5}{6}\right)$$



Draw the reference triangle in the correct quadrant first.

Find the missing side using Pythagorean Thm.

Find the ratio of the cosine of the reference triangle.

$$\cos\theta = \frac{6}{\sqrt{61}}$$

For each of the following give the value without a calculator.

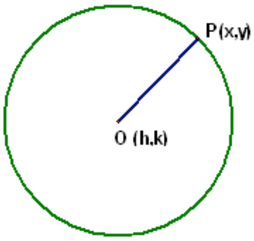
56. $\tan\left(\arccos\frac{2}{3}\right)$

57. $\sec\left(\sin^{-1}\frac{12}{13}\right)$

58. $\sin\left(\arctan\frac{12}{5}\right)$

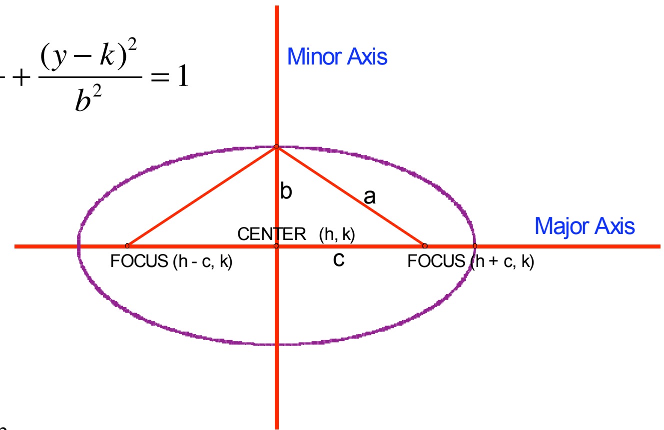
59. $\sin\left(\sin^{-1}\frac{7}{8}\right)$

Circles and Ellipses



$$r^2 = (x-h)^2 + (y-k)^2$$

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

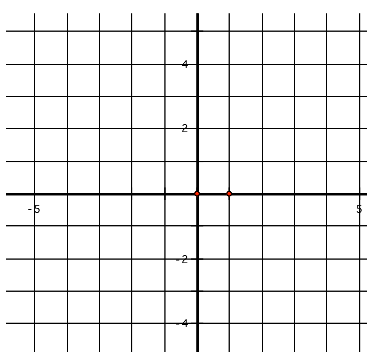


For a circle centered at the origin, the equation is $x^2 + y^2 = r^2$, where **r** is the radius of the circle.

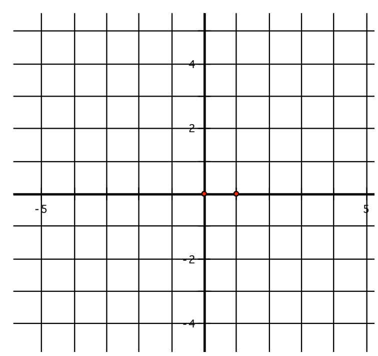
For an ellipse centered at the origin, the equation is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where **a** is the distance from the center to the ellipse along the x-axis and **b** is the distance from the center to the ellipse along the y-axis. If the larger number is under the y^2 term, the ellipse is elongated along the *y*-axis. For our purposes in Calculus, you will not need to locate the foci.

Graph the circles and ellipses below:

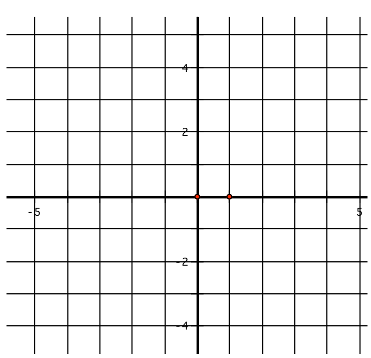
60. $x^2 + y^2 = 16$



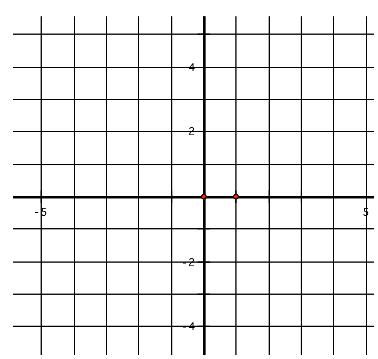
61. $x^2 + y^2 = 5$



62. $\frac{x^2}{1} + \frac{y^2}{9} = 1$



63. $\frac{x^2}{16} + \frac{y^2}{4} = 1$



Vertical Asymptotes

Determine the vertical asymptotes for the function. Set the denominator equal to zero to find the x-value for which the function is undefined. That will be the vertical asymptote.

64. $f(x) = \dfrac{1}{x^2}$

65. $f(x) = \dfrac{x^2}{x^2 - 4}$

66. $f(x) = \dfrac{2 + x}{x^2(1 - x)}$

Horizontal Asymptotes

Determine the horizontal asymptotes using the three cases below.

Case I. Degree of the numerator is less than the degree of the denominator. The asymptote is y = 0.

Case II. Degree of the numerator is the same as the degree of the denominator. The asymptote is the ratio of the lead coefficients.

Case III. Degree of the numerator is greater than the degree of the denominator. There is no horizontal asymptote. The function increases without bound. (If the degree of the numerator is exactly 1 more than the degree of the denominator, then there exists a slant asymptote, which is determined by long division.)

Determine all Horizontal Asymptotes.

67. $f(x) = \dfrac{x^2 - 2x + 1}{x^3 + x - 7}$

68. $f(x) = \dfrac{5x^3 - 2x^2 + 8}{4x - 3x^3 + 5}$

69. $f(x) = \dfrac{4x^5}{x^2 - 7}$

Laws of Exponents

Write each of the following expressions in the form $ca^p b^q$ where c, p and q are constants (numbers).

70. $\dfrac{(2a^2)^3}{b}$

71. $\sqrt{9ab^3}$

(Hint: $\sqrt{x} = x^{1/2}$)

72. $\dfrac{a(2/b)}{3/a}$

73. $\dfrac{ab-a}{b^2-b}$

74. $\dfrac{a^{-1}}{(b^{-1})\sqrt{a}}$

75. $\left(\dfrac{a^{\frac{2}{3}}}{b^{\frac{1}{2}}}\right)^2 \left(\dfrac{b^{\frac{3}{2}}}{a^{\frac{1}{2}}}\right)$

Laws of Logarithms

Simplify each of the following:

76. $\log_2 5 + \log_2(x^2-1) - \log_2(x-1)$

77. $2\log_2 9 - \log_2 3$

78. $3^{2\log_3 5}$

79. $\log_{10}(10^{1/2})$

80. $\log_{10}(\dfrac{1}{10^x})$

81. $2\log_{10}\sqrt{x} + \log_{10} x^{1/3}$

Solving Exponential and Logarithmic Equations

Solve for x. (DO NOT USE A CALCULATOR)

82. $5^{(x+1)} = 25$

83. $\dfrac{1}{3} = 3^{2x+2}$

84. $\log_2 x^2 == 3$

85. $\log_3 x^2 = 2\log_3 4 - 4\log_3 5$

Change an Absolute Value function to a Piecewise function.

Concept: If $|x| = 4$ then x = 4 or –x = 4.

Example: $f(x) = |3 - 2x|$

1. Set up the piecewise function with the expression as it appears and with the opposite of the function.

$$f(x) = \begin{cases} 3 - 2x \\ -(3 - 2x) \end{cases}$$

2. Find the point x-value that function changes functions (bottom of the "V"): set the expression in the absolute value bars equal to 0.

$$3 - 2x = 0$$
$$3 = 2x$$
$$\frac{3}{2} = x$$

3. The piecewise function becomes:

$$f(x) = \begin{cases} 3 - 2x & x \quad \frac{3}{2} \\ -3 + 2x & x \quad \frac{3}{2} \end{cases}$$

4. Determine which inequality sign should be used for each branch to ensure positive y-values.

$$f(x) = \begin{cases} 3 - 2x & x \leq \frac{3}{2} \\ -3 + 2x & x \geq \frac{3}{2} \end{cases}$$

5. If there are numbers outside the absolute value sign, they are included after the inequality signs have been set.

Example:

$$g(x) = |x-4| + 3$$

$$g(x) = \begin{cases} x-4 \\ -x+4 \end{cases}$$

$$x-4=0; \quad x=4$$

$$g(x) = \begin{cases} x-4 & x \geq 4 \\ -x+4 & x \leq 4 \end{cases}$$

$$g(x) = \begin{cases} x-4+3 & x \geq 4 \\ -x+4+3 & x \leq 4 \end{cases}$$

$$g(x) = \begin{cases} x-1 & x \geq 4 \\ -x+7 & x \leq 4 \end{cases}$$

86. $h(x) = |7-x|$

87. $k(x) = |4x-5|$

88. $f(x) = |8-x| - 5$

Trigonometric Identities

Use trig identities to simplify the expression to a single trigonometric identity.
Example.

Given: $\csc^2\theta\tan^2\theta-1$

Use Trig Functions: $\frac{1}{\sin^2\theta}\cdot\frac{\sin^2\theta}{\cos^2\theta}-1$

$\frac{1}{\cos^2\theta}-1$

$\sec^2\theta-1$

$\tan^2\theta$

Rewrite the following expressions using a single trig function.

89. $\frac{\sec\theta\sin\theta}{\tan\theta+\cot\theta}$

90. $\frac{\sec^2 x}{\sec^2 x-1}$

91. $\cos\theta\left(\frac{1}{\cos\theta}-\frac{\cot\theta}{\csc\theta}\right)$

92. $\frac{2\tan\theta}{1+\tan^2\theta}$

Simplifying Rational Expressions

To add or subtract fractions, first find a common denominator.

$$\frac{2x+3}{x+1}-\frac{4x}{x+2}=\frac{2x+3}{x+1}\cdot\frac{x+2}{x+2}-\frac{4x}{x+2}\cdot\frac{x+1}{x+1}=\frac{2x^2+7x+6}{(x+1)(x+2)}-\frac{4x^2+4x}{(x+1)(x+2)}=\frac{2x^2+7x+6-4x^2-4x}{(x+1)(x+2)}=\frac{-2x^2+3x+6}{(x+1)(x+2)}$$

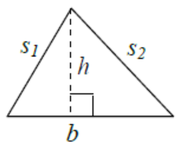
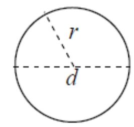
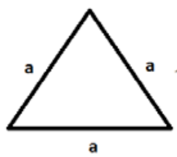
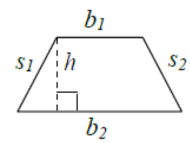
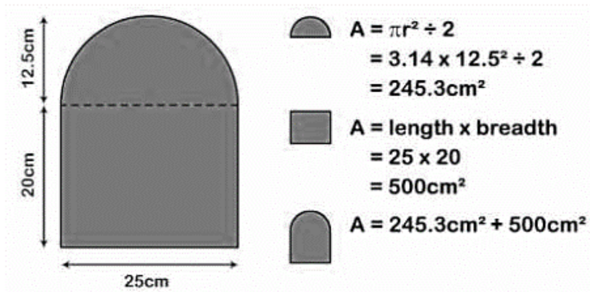
To simplify fractions, factor the numerator and denominator then reduce any common factors.

$$\frac{4x^2-5x-6}{3x^2-x-10}=\frac{(4x+3)(x-2)}{(x-2)(3x+5)}=\frac{4x+3}{3x+5}$$

Simplify each expression:

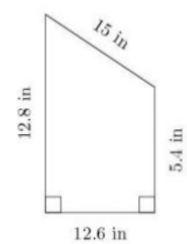
93. $\frac{3}{5}x+\frac{2}{3}$
94. $\frac{x}{4}-\frac{7x}{2}$
95. $\frac{3}{4}\left(\frac{1}{2}x+8\right)$
96. $\frac{5x}{x+2}-\frac{3}{x}$
97. $\frac{3x^2+7x-9}{2x}$
98. $\frac{x^2-18x+45}{x^2-2x-3}$
99. $\frac{3x^2+10x+8}{x^2+2x}$
100. $\frac{2x+3}{x-2}+\frac{3x}{x+1}$
101. $\frac{2x^2+15x-8}{x+8}-\frac{4x-3}{x+1}$

<u>Area Formulas</u>

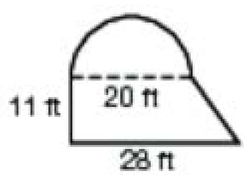
<table>
<tr><td>Triangle

$A = \frac{1}{2}bh$</td><td>Circle

$A = \pi * r^2$</td></tr>
<tr><td>Equilateral Triangle

$A = \frac{\sqrt{3}}{4}a^2$</td><td>Trapezoid

$A = \frac{1}{2}h(b_1 + b_2)$</td></tr>
<tr><td colspan="2">Example: To find the area of a composite shape, recognize and separate shapes whose area formulas you know. Find the areas of these pieces, and take their sum.
</td></tr>
</table>

Find the areas of the following figures:

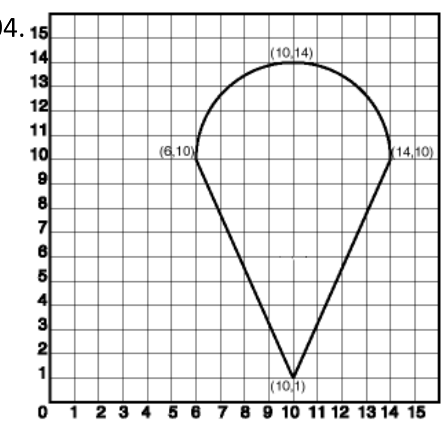
102.



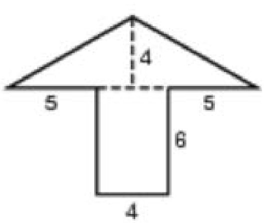
103.



104.

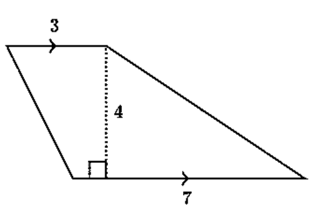


105.

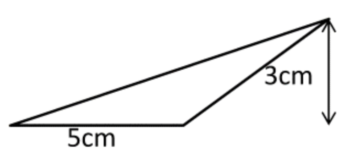


106. What is the area of an equilateral triangle of perimeter 45 cm?

107.



108.



Factor Completely

109. $x^6 - 16x^4$ 110. $4x^3 - 8x^2 - 25x + 50$ 111. $8x^3 + 27$ 112. $x^4 - 1$

Solve the following equations for the indicated variables:

113. $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1,\ for\ a.$ 114. $V = 2(ab + bc + ca),\ for\ a.$

115. $A = P + xrP,\ for\ P$ 116. $2x - 2yd = y + xd,\ for\ d$

Solve the equations for x:

107. $4x^2 + 12x + 3 = 0$ 108. $2x + 1 = \frac{5}{x+2}$ 109. $\frac{x+1}{x} - \frac{x}{x+1} = 0$

Polynomial Division

110. $(x^5 - 4x^4 + x^3 - 7x + 1) \div (x + 2)$ 111. $(x^5 - x^4 + x^3 + 2x^2 - x + 4) \div (x^3 + 1)$

AP CALCULUS

SUMMER WORK PART 2

Graph the parent function of each set using your calculator. Draw a quick sketch on your paper of each additional equation in the family. Check your sketch with the graphing calculator. You may have to look up how to use a graphing calculator to complete this section. You also may need to download a digital TI-84 calculator to complete this assignment if you do not have one.

1) Parent Function: $\mathbf{y = x^2}$

a) $y = x^2 - 5$

b) $y = x^2 + 3$

c) $y = (x-10)^2$

d) $y = (x+8)^2$

e) $y = 4x^2$

f) $y = 0.25x^2$

g) $y = -x^2$

h) $y = -(x+3)^2 + 6$

I) $y = (x+4)^2 - 8$

j) $y = -2(x+1)^2 + 4$

k) $y = \frac{1}{3}(x-6)^2 - 6$

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

2) Parent Function: **y = sin(x)** (set mode to RADIANS)

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

b) $y = \sin(x) - 2$

c) $y = 2\sin(x)$

d) $y = 2\sin(2x) + 2$

3) Parent Function: **y = cos(x)**

a) $y = \cos(3x)$

b) $y = \cos(x/2)$

c) $y = 2\cos(x) + 2$

d) $y = -2\cos(x) - 1$

4) Parent Function: $\mathbf{y = x^3}$

a) $y = x^3 + 2$

b) $y = -x^3$

b) $y = x^3 - 5$

c) $y = -x^3 + 3$

e) $y = (x-4)^3$

f) $y = (x-1)^3 - 4$

g) $y = -2(x+2)^3 + 1$

h) $y = x^3 + x$

5) Parent Function: $y = \sqrt{x}$

a) $y = \sqrt{x} - 2$

b) $y = \sqrt{-x}$

c) $y = \sqrt{x} + 5$

d) $y = \sqrt{6 - x}$

e) $y = -\sqrt{x}$

f) $y = -\sqrt{-x}$

g) $y = \sqrt{x + 2}$

h) $y = \sqrt{2x - 6}$

i) $y = -2\sqrt{x}$

j) $y = -\sqrt{4 - x}$

6) Parent Function: $\mathbf{y = \ln(x)}$

a) $y = \ln(x+3)$

b) $y = \ln(x) + 3$

c) $y = \ln(x-2)$

d) $y = \ln(-x)$

e) $y = -\ln(x)$

f) $y = \ln(|x|$

g) $y = \ln(2x) - 4$

h) $y = -3\ln(x) + 1$

7) Parent Function: $\mathbf{y = e^x}$

a) $y = e^{2x}$

b) $y = e^{x-2}$

c) $y = e^{2-x}$

d) $y = e^{2x} + 3$

e) $y = -e^x$

f) $y = e^{-x}$

g) $y = 2 - e^x$

h) $y = e^{0.5x}$

8) Parent Function **$y = a^x$**

a) $y = 5^x$

b) $y = 2^x$

c) $y = 3^{-x}$

d) $y = ½^x$

e) $y = 4^{x-3}$

f) $y = 2^{x-3} + 2$

9) Parent Function: **$y = 1/x$**

a) $y = 1/(x-2)$

b) $y = -1/x$

c) $y = 1/(x+4)$

d) $y = 2/(5-x)$

10) Parent Function: **$y = [x]$**

Note: $[x]$ is the IntegerPart of x. On the TI-83/84 it is found in the MATH menu, NUM submenu.

a) $y = [x] + 2$

b) $y = [x-3]$

c) $y = [3x]$

d) $y = [0.25x]$

e) $y = 3 - [x]$

e) $y = 2[x] - 1$

11) Resize your viewing window to [0,1] x [0,1]. <u>Graph all of the following functions in the same window.</u> List the functions from the highest graph to the lowest graph. How do they compare for values of x > 1?

a) $y = x^2$

b) $y = x^3$

c) $y = \sqrt{x}$

d) $y = x^{2/3}$

e) $y = |x|$

f) $y = x^4$

12) Given: $f(x) = x^4-3x^3+2x^2-7x-11$
Find all roots to the nearest 0.001

13) Given: $f(x) = 3 \sin 2x - 4x + 1$ from $[-2\pi, 2\pi]$
Find all roots to the nearest 0.001.
Note: All trig functions are done in radian mode.

14) Given: $f(x) = 0.7x^2 + 3.2x + 1.5$
Find all roots to the nearest 0.001.

15) Given: $f(x) = x^4 - 8x^2 + 5$
Find all roots to the nearest 0.001.

16) Given: $f(x) = x^3 + 3x^2 - 10x - 1$
Find all roots to the nearest 0.001

17) Given: $f(x) = 100x^3 - 203x^2 + 103x - 1$
Find all roots to the nearest 0.001

18) Given: $f(x) = |x-3| + |x| - 6$
Find all roots to the nearest 0.001

19) Given: $f(x) = |x| - |x-6| = 0$
Find all roots to the nearest 0.001

Solve the following inequalities

20) $x^2 - x - 6 > 0$

21) $x^2 - 2x - 5 \geq 3$

22) $x^3 - 4x < 0$

For each of the following (problems 23-26)

a) Sketch the graph of $f(x)$
b) Sketch the graph of $|f(x)|$
c) Sketch the graph of $f(|x|)$
d) Sketch the graph of $f(2x)$
e) Sketch the graph of $2f(x)$

23) $f(x) = 2x+3$

24) $f(x) = x^2 - 5x - 3$

25) $f(x) = 2\sin(3x)$

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

27) Let $f(x) = \sin x$
Let $g(x) = \cos x$

a) Sketch the graph of f^2
b) Sketch the graph of g^2
c) Sketch the graph of $f^2 + g^2$

28) Given: $f(x) = 3x+2$
$g(x) = -4x-2$
Find the point of intersection

29) Given: $f(x) = x^2 - 5x + 2$
$g(x) = 3-2x$
Find the coordinates of any points of intersection.

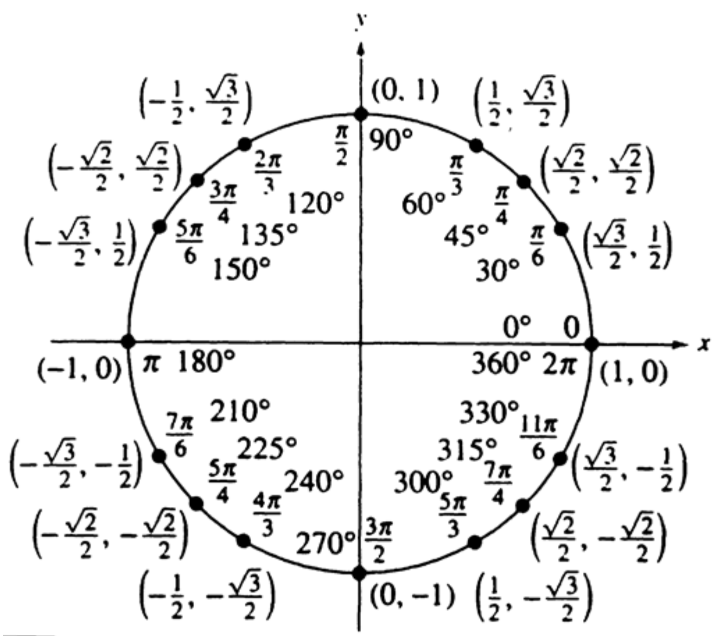
30) How many times does the graph of $y = 0.1x$ intersect the graph of $y = \sin(2x)$?

31) Given: $f(x) = x^4 - 7x^3 + 6x^2 + 8x + 9$

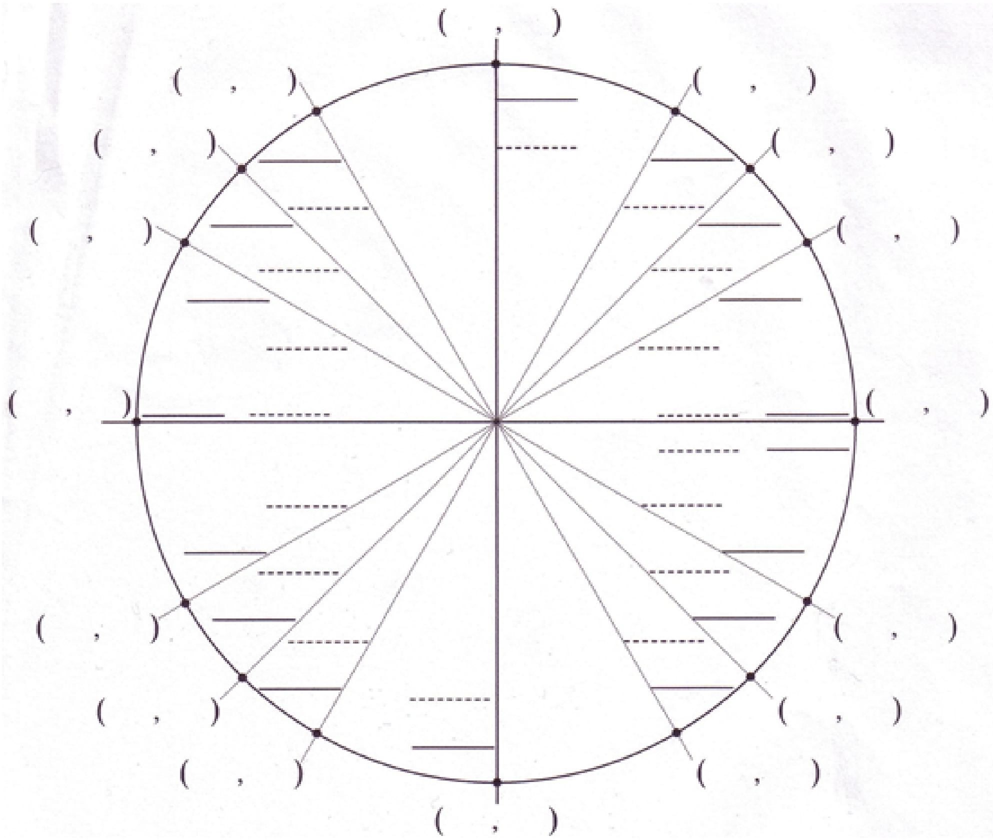
a) Determine the x- and y-coordinates of the lowest point on the graph.

b) Size the x-window from [-10,10]. Find the highest and lowest values of f(x) over the interval $-10 \le x \le 10$

YOU MUST HAVE THE UNIT CIRCLE MEMORIZED



Here is a blank Unit Circle that you can print and use to practice



You must also memorize this chart. You will have a quiz on day 2 of class.

Degrees	Radians	sin θ	cos θ	tan θ	cot θ	sec θ	csc θ
0°	0	0	1	0	Undefined	1	Undefined
30°	$\pi/6$	1/2	$\sqrt{3}/2$	$\sqrt{3}/3$	$\sqrt{3}$	$2\sqrt{3}/3$	2
45°	$\pi/4$	$\sqrt{2}/2$	$\sqrt{2}/2$	1	1	$\sqrt{2}$	$\sqrt{2}$
60°	$\pi/3$	$\sqrt{3}/2$	1/2	$\sqrt{3}$	$\sqrt{3}/3$	2	$2\sqrt{3}/3$
90°	$\pi/2$	1	0	Undefined	0	Undefined	1
120°	$2\pi/3$	$\sqrt{3}/2$	-1/2	$-\sqrt{3}$	$-\sqrt{3}/3$	-2	$2\sqrt{3}/3$
135°	$3\pi/4$	$\sqrt{2}/2$	$-\sqrt{2}/2$	-1	-1	$-\sqrt{2}$	$\sqrt{2}$
150°	$5\pi/6$	1/2	$-\sqrt{3}/2$	$-\sqrt{3}/3$	$-\sqrt{3}$	$-2\sqrt{3}/3$	2
180°	π	0	-1	0	Undefined	-1	Undefined
210°	$7\pi/6$	-1/2	$-\sqrt{3}/2$	$\sqrt{3}/3$	$\sqrt{3}$	$-2\sqrt{3}/3$	-2
225°	$5\pi/4$	$-\sqrt{2}/2$	$-\sqrt{2}/2$	1	1	$-\sqrt{2}$	$-\sqrt{2}$
240°	$4\pi/3$	$-\sqrt{3}/2$	-1/2	$\sqrt{3}$	$\sqrt{3}/3$	-2	$-2\sqrt{3}/3$
270°	$3\pi/2$	-1	0	Undefined	0	Undefined	-1
300°	$5\pi/3$	$-\sqrt{3}/2$	1/2	$-\sqrt{3}$	$-\sqrt{3}/3$	2	$-2\sqrt{3}/3$
315°	$7\pi/4$	$-\sqrt{2}/2$	$\sqrt{2}/2$	-1	-1	$\sqrt{2}$	$-\sqrt{2}$
330°	$11\pi/6$	-1/2	$\sqrt{3}/2$	$-\sqrt{3}/3$	$-\sqrt{3}$	$2\sqrt{3}/3$	-2
360°	2π	0	1	0	Undefined	1	Undefined

Name	Ratio	Notation
Sine	opposite/hypotenuse	Sin(θ)
Cosine	adjacent/hypotenuse	Cos(θ)
Tangent	opposite/adjacent	Tan(θ)
Cosecant (1/Sine)	hypotenuse/opposite	Cosec(θ) or csc(θ)
Secant (1/Cosine)	hypotenuse/adjacent	Sec(θ)
Cotangent (1/Tangent)	adjacent/opposite	Cot(θ)