AP Calculus AB/BC Summer Packet Name:__________________________________

- This packet is to be completed and handed-in to Mr. Hobbs at the beginning of the first class for the fall semester.
- Valid & appropriate work must be shown in the packet or on separate sheets of paper attached to packet (or forfeit points.)
- The answer for each problem must be easily found. (i.e. Circle the answer, highlight the answer, make an answer column, or ...)
- Be prepared for a test on the material in this packet on the first day of class in the fall semester.

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

Functions

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. $f(2) =$ ____________ 7. $g(-3) =$ ____________ 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. $f\left(\dfrac{2\pi}{3}\right) =$ ____________

Let $f(x) = x^2$, $g(x) = 2x + 5$, *and* $h(x) = x^2 - 1$. **Find each.**

14. $h\left[f(-2)\right] =$ _______ 15. $f\left[g(x-1)\right] =$ _______ 16. $g\left[h(x^3)\right] =$ _______

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

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

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

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.

19. $y=2x-5$

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

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

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

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

$$x^2 + y - 16x + 39 = 0$$
$$x^2 - y^2 - 9 = 0$$

<u>Elimination Method</u>

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

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

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

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

Plug $x=3$ *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 $(5,4)$, $(5,-4)$ *and* $(3,0)$

<u>Substitution Method</u>

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 previous example*)

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

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

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

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

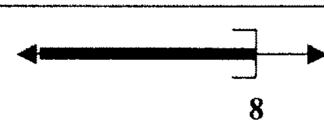
23. $x + y = 8$
$4x - y = 7$

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

25. $x^2 - 4y^2 - 20x - 64y - 172 = 0$
$16x^2 + 4y^2 - 320x + 64y + 1600 = 0$

<u>Interval Notation</u>

26. Complete the table with the appropriate notation or graph.

Solution	Interval Notation	Graph
$-2 < x \leq 4$		
	$[-1,7)$	
		

Solve each equation. State your answer in BOTH interval notation and graphically.

27. $2x - 1 \geq 0$

28. $-4 \leq 2x - 3 < 4$

29. $\frac{x}{2} - \frac{x}{3} > 5$

Domain and Range

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

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

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

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

33. $f(x) = \frac{2}{x-1}$

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.

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

35. $f(x) = \frac{x^2}{3}$

Also, recall that to PROVE one function is an inverse of another function, you need to show that: $f(g(x)) = g(f(x)) = x$

Example:

If: $f(x) = \frac{x-9}{4}$ *and* $g(x) = 4x+9$ **show *f(x) and g(x)* are inverses of each other.**

$$f(g(x)) = 4\left(\frac{x-9}{4}\right)+9$$
$$= x-9+9$$
$$= x$$

$$g(f(x)) = \frac{(4x+9)-9}{4}$$
$$= \frac{4x+9-9}{4}$$
$$= \frac{4x}{4}$$
$$= x$$

$f(g(x)) = g(f(x)) = x$ therefore they are inverses of each other.

Prove *f and g* are inverses of each other.

36. $f(x) = \frac{x^3}{2}$ $\quad g(x) = \sqrt[3]{2x}$

37. $f(x) = 9 - x^2,\ x \geq 0$ $\quad g(x) = \sqrt{9-x}$

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)

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

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

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

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

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

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

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

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

Determine the maximum or minimum value(s) of the function. First, find the critical numbers, then use a sign chart to test whether a maximum value, a minimum value or neither exists at the critical number.

Example:

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

$f'(x) = 3x^2 - 6x$

$0 = 3x(x-2)$

critical numbers: x = 0, x = 2

Sign chart: $f'(-1) > 0$ $\quad f'(1) < 0 \quad$ $f'(3) > 0$

$$\longleftarrow \; 0 \; \longrightarrow \; 2 \; \longrightarrow$$

The sign of the derivative changes from positive to negative at x = 0, so we have a **maximum** at the point (0, 0). The sign of the derivative changes from negative to positive at x = 2, so we have a **minimum** at the point (2, -4).

57. $f(x) = x^2 - 2x$

58. $f(x) = x^3 - 12x$

Omit #'s 57 & 58

Radian and Degree Measure

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

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

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

Angles in Standard Position

61. Sketch the angle in standard position.

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

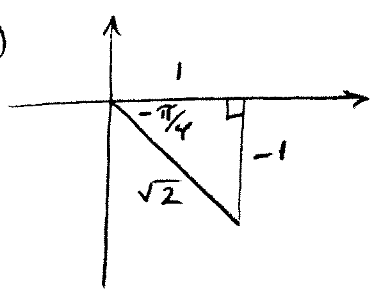
Reference Triangles

62. 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°

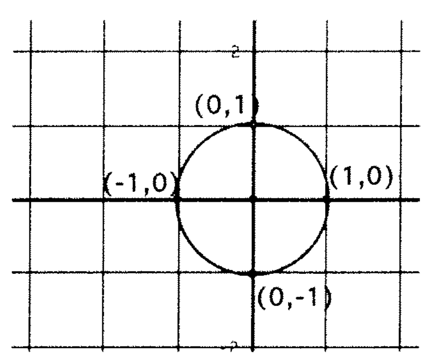
Ex.



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.

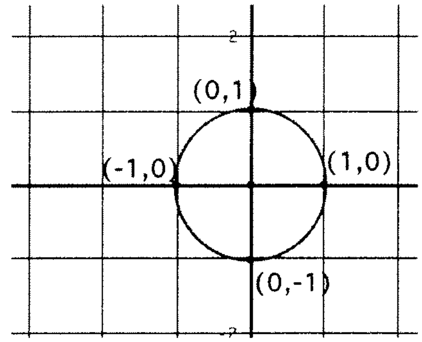
Example: $\sin 90^{\circ} = 1$ $\cos\frac{\pi}{2} = 0$



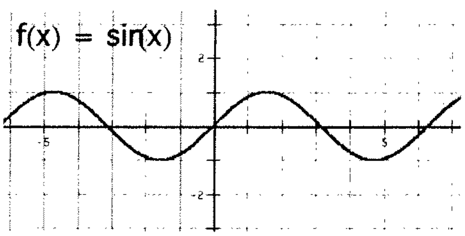
63. $a.)\ \sin 180^\circ$ $b.)\ \cos 270^\circ$

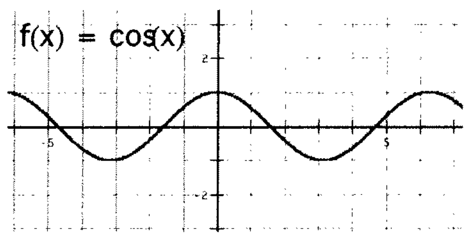
$c.)\ \sin(-90^\circ)$ $d.)\ \sin \pi$

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



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.

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

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

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

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

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 end of the packet.)

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

69. $2\cos x = \sqrt{3}$

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

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

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

73. $2\cos^2 x - 1 - \cos x = 0$

74. $4\cos^2 x - 3 = 0$

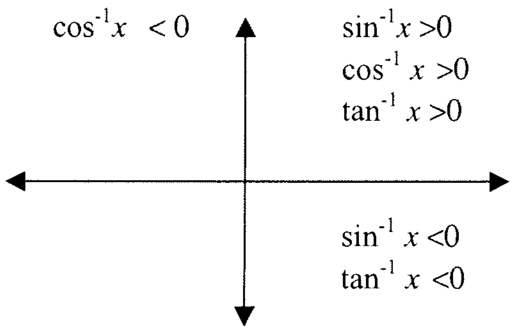
75. $\sin^2 x + \cos 2x - \cos x = 0$

Inverse Trigonometric Functions:

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

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

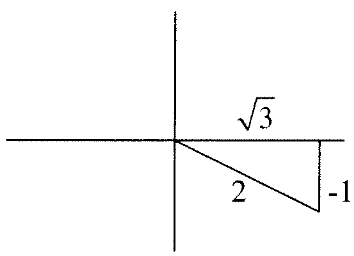
Inverse trig functions are defined only in the quadrants as indicated below due to their restricted domains.



Example:

Express the value of "y" in radians.

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



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

$$\frac{-\pi}{2} < y < \frac{\pi}{2}$$

Answer: y = $-\frac{\pi}{6}$

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

76. $y = \arcsin\frac{-\sqrt{3}}{2}$

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

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

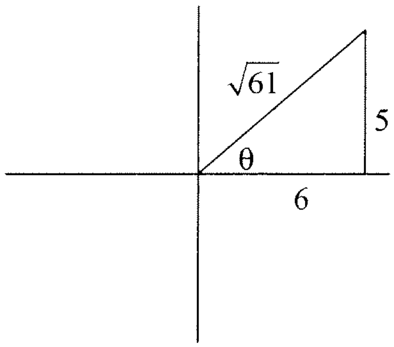
Example: Find the value without a calculator.

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

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.

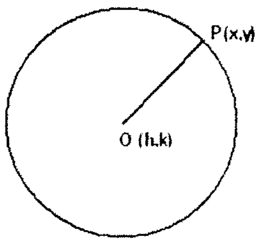
79. $\tan\left(\arccos\frac{2}{3}\right)$

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

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

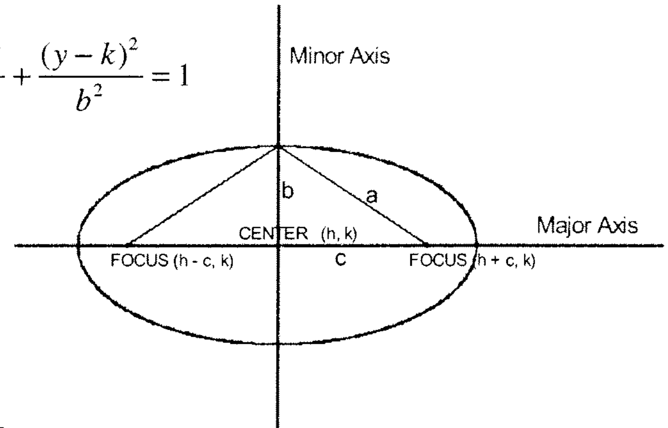
82. $\sin\left(\sin^{-1}\frac{7}{8}\right)$

Circles and Ellipses



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

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

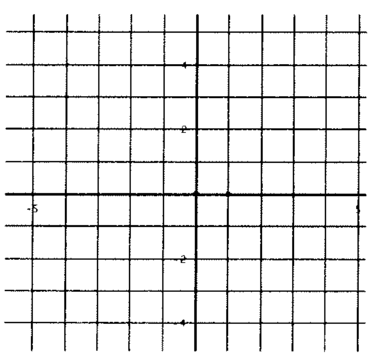


For a circle centered at the origin, the equation is $x^2 + y^2 = r^2$, where **r** is the radius of the circle.

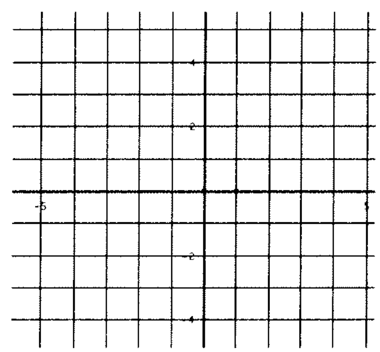
For an ellipse centered at the origin, the equation is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where **a** is the distance from the center to the ellipse along the x-axis and **b** is the distance from the center to the ellipse along the y-axis. If the larger number is under the y^2 term, the ellipse 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:

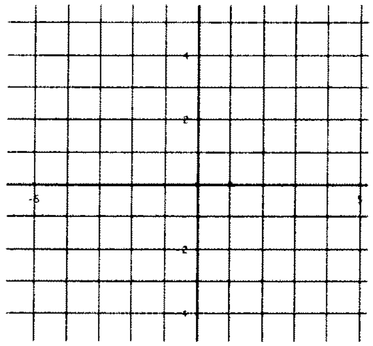
83. $x^2 + y^2 = 16$



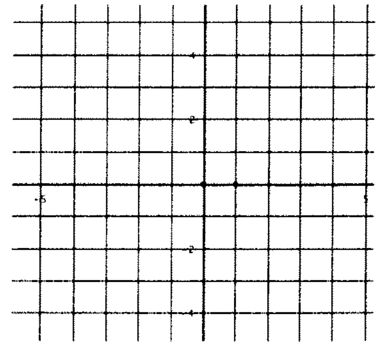
84. $x^2 + y^2 = 5$



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



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



Limits

Finding limits numerically.

Complete the table and use the result to estimate the limit.

87. $\lim_{x \to 4} \frac{x-4}{x^2 - 3x - 4}$

x	3.9	3.99	3.999	4.001	4.01	4.1
f(x)						

88. $\lim_{x \to -5} \frac{\sqrt{4-x} - 3}{x+5}$

x	-5.1	-5.01	-5.001	-4.999	-4.99	-4.9
f(x)						

Finding limits graphically.

Find each limit graphically. Use your calculator to assist in graphing.

89. $\lim_{x \to 0} \cos x$

90. $\lim_{x \to 5} \frac{2}{x-5}$

91. $\lim_{x \to 1} f(x)$

$$f(x) = \begin{cases} x^2 + 3, & x \neq 1 \\ 2, & x = 1 \end{cases}$$

Evaluating Limits Analytically

Solve by direct substitution whenever possible. If needed, rearrange the expression so that you can do direct substitution.

92. $\lim_{x \to 2} (4x^2 + 3)$

93. $\lim_{x \to 1} \frac{x^2 + x + 2}{x + 1}$

94. $\lim_{x \to 0} \sqrt{x^2 + 4}$

95. $\lim_{x \to \pi} \cos x$

96. $\lim_{x \to 1} \left(\frac{x^2 - 1}{x - 1} \right)$ HINT: Factor and simplify.

97. $\lim_{x \to -3} \frac{x^2 + x - 6}{x + 3}$

98. $\lim_{x \to 0} \frac{\sqrt{x+1} - 1}{x}$ HINT: Rationalize the numerator.

99. $\lim_{x \to 3} \frac{3 - x}{x^2 - 9}$

100. $\lim_{h \to 0} \frac{2(x+h) - 2x}{h}$

One-Sided Limits

Find the limit if it exists. First, try to solve for the overall limit. If an overall limit exists, then the one-sided limit will be the same as the overall limit. If not, use the graph and/or a table of values to evaluate one-sided limits.

101. $\lim_{x \to 5^+} \frac{x - 5}{x^2 - 25}$

102. $\lim_{x \to -3^-} \frac{x}{\sqrt{x^2 - 9}}$

103. $\lim_{x \to 10^+} \frac{|x - 10|}{x - 10}$

104. $\lim_{x \to 5^-} \left(-\frac{3}{x + 5} \right)$

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.

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

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

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

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.

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

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

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

Limits to Infinity

A rational function does not have a limit if it goes to $\pm\infty$, however, you can state the direction the limit is headed if both the left and right hand side go in the same direction.

Determine each limit if it exists. If the limit approaches ∞ *or* $-\infty$, please state which one the limit approaches.

111. $\lim\limits_{x\to -1^+}\dfrac{1}{x+1}=$

112. $\lim\limits_{x\to 1^+}\dfrac{2+x}{1-x}=$

113. $\lim\limits_{x\to 0}\dfrac{2}{\sin x}=$

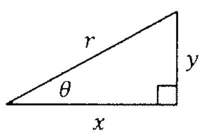
AP Calculus – Reminder Formulae

$\cos\theta = \dfrac{x}{r}$

$\sin\theta = \dfrac{y}{r}$

$\tan\theta = \dfrac{y}{x}$

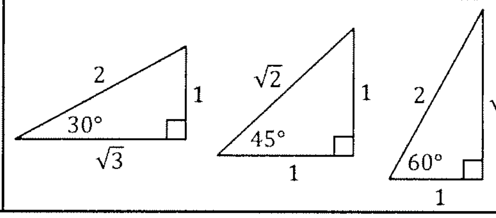
$x^2 + y^2 = r^2$

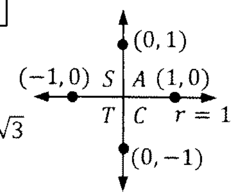


$\theta = \dfrac{s}{r}$ **or** $s = r\theta$

Where:
$s = arc\ length$,
$r = radius\ length$, and
$\theta = angle\ in\ radians$

$\frac{\pi}{6} = 30°$	$\frac{\pi}{4} = 45°$	$\frac{\pi}{3} = 60°$	$\frac{\pi}{2} = 90°$





Basic Trig Identities

$\sin\theta = \dfrac{1}{\csc\theta}$ $\quad \cos\theta = \dfrac{1}{\sec\theta}$ $\quad \tan\theta = \dfrac{\sin\theta}{\cos\theta}$ *or* $\dfrac{1}{\cot\theta}$

$\csc\theta = \dfrac{1}{\sin\theta}$ $\quad \sec\theta = \dfrac{1}{\cos\theta}$ $\quad \cot\theta = \dfrac{\cos\theta}{\sin\theta}$ *or* $\dfrac{1}{\tan\theta}$

Pythagorean Identities

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

$\tan^2\theta + 1 = \sec^2\theta$

$1 + \cot^2\theta = \csc^2\theta$

Opposite Angles or (Even vs. Odd)

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

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

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

Complementary Cofunctions

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

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

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

Angle Addition Laws

$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$

$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$

$\tan(\alpha \pm \beta) = \dfrac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$

Double Angle Identities

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

$\cos(2\theta) = \begin{cases} 2\cos^2\theta - 1 \\ \cos^2\theta - \sin^2\theta \\ 1 - 2\sin^2\theta \end{cases}$

$\tan(2\theta) = \dfrac{2\tan\theta}{1 - \tan^2\theta}$

Half-Angle Identities

$\cos^2 x = \dfrac{1 + \cos 2x}{2}$

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

Degrees to Radians:
multiply by $\frac{\pi}{180°}$
Radians to Degrees:
multiply by $\frac{180°}{\pi}$

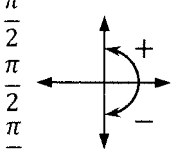
Inverse Trig Functions

(used to find angles – one answer only)
Boundaries, based upon the graph of the inverse trig functions, are shown below.

$\dfrac{-\pi}{2} \le \sin^{-1}x \le \dfrac{\pi}{2}$

$\dfrac{-\pi}{2} \le \csc^{-1}x \le \dfrac{\pi}{2}$

$\dfrac{-\pi}{2} < \tan^{-1}x < \dfrac{\pi}{2}$

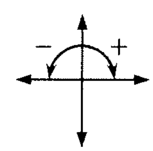


PS $\csc^{-1}x \ne 0$

$0 \le \cos^{-1}x \le \pi$

$0 \le \sec^{-1}x \le \pi$

$0 < \cot^{-1}x < \pi$

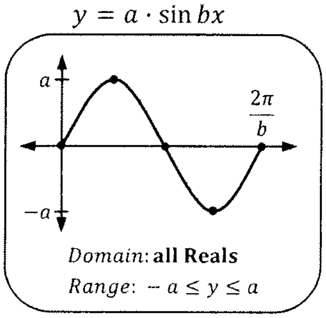


PS $\sec^{-1}x \ne \frac{\pi}{2}$

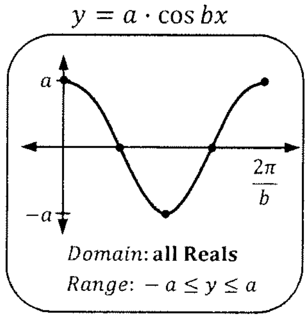
Trig Graphing Review

Shown below is one period of the total graph for each trig function when $a > 0$.
The 5 key points (beginning, middle, end, ¼, and ¾ points) are emphasized.

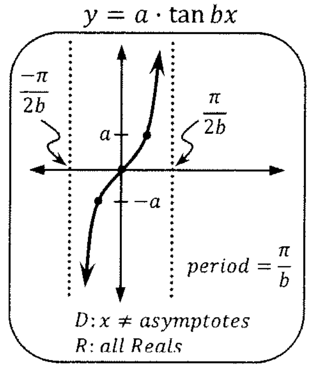
$y = a \cdot \sin bx$



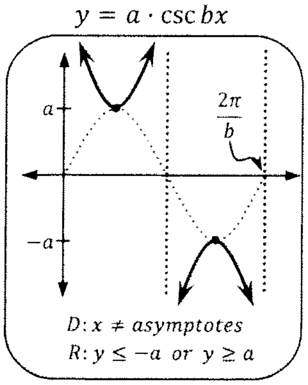
$y = a \cdot \cos bx$



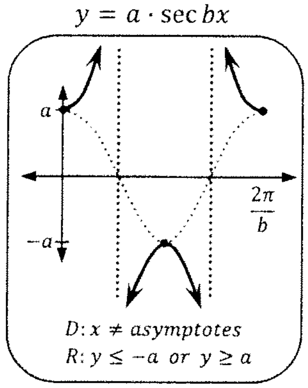
$y = a \cdot \tan bx$



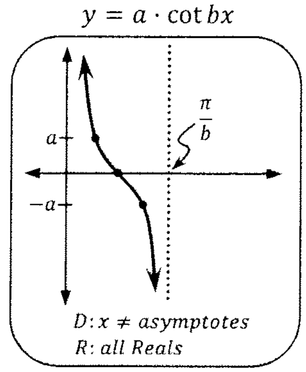
$y = a \cdot \csc bx$



$y = a \cdot \sec bx$



$y = a \cdot \cot bx$

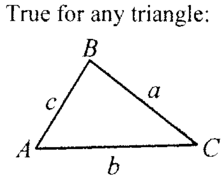


Also, each of the following trig graphs can be shifted Left or Right and/or Up or Down.

$$y = a \cdot trig\ function\ [b(x - c)] + d$$

If a trig function shifts, then all of the key points shift with it to the new location.

True for any triangle:



Law of Sines:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines:

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$
$$b^2 = a^2 + c^2 - 2ac \cdot \cos B$$
$$c^2 = a^2 + b^2 - 2ab \cdot \cos C$$

$Area\ \Delta ABC = \dfrac{1}{2}bc \cdot \sin A$

$Area\ \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$,
Where s is the semi-perimeter for $\Delta\ ABC$. { *i.e.* $s = \frac{a+b+c}{2}$ }

Some additional formulae:

Equations for Lines

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

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

Slope formula for a line (leads to point-slope form): $m = \frac{y_2 - y_1}{x_2 - x_1}$ or $m = \frac{\Delta y}{\Delta x}$

Standard form: $Ax + By + C = 0$

Logarithms

Definition: $log_b x = y \quad \leftrightarrow \quad b^y = x$
$b > 0, b \neq 1, \& \, x > 0$

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

Quotient property: $log_b \left(\frac{m}{n}\right) = log_b m - log_b n$

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

Equality property: If $log_b m = log_b n$, then $m = n$.

Change of base: $\frac{log_b x}{log_b y} = log_y x$

Slope of a tangent line to a function $y = f(x)$: $m(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

AP Calc AB/BC Summer Packet (Selected Answers)

(109) $y = -5/3$

(111) $+\infty$

(113) DNE

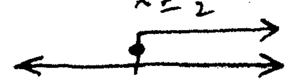
(1) $\frac{5-a}{a}$ or $\frac{5}{a} - 1$ (3) $\frac{4x-12}{5x}$ (5) $\frac{x-4}{3x^2-4x+32}$

(7) 17 (9) 15 (11) 2 (13) $\frac{\sqrt{3}}{2}$

(15) $4x^2 + 12x + 9$ (17) 9 (19) x-int $= (\frac{5}{2}, 0)$; y-int $= (0, -5)$

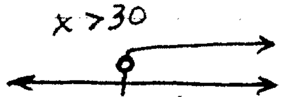
(21) x-ints $= (\pm 4, 0)$ & $(0, 0) \leftarrow$ y-int too!

(23) $(3, 5)$ (25) $(6, -8)$ & $(14, -8)$ (27) $x \geq \frac{1}{2}$



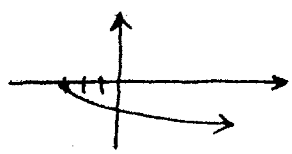
$[1/2, \infty)$

(29) $x > 30$



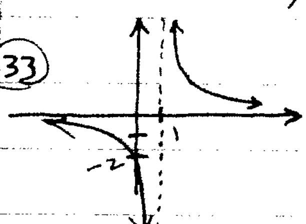
$(30, \infty)$

(31)



D: $[-3, \infty)$
R: $(-\infty, 0]$

(33)



D: $(-\infty, 1) \cup (1, \infty)$
R: $(-\infty, 0) \cup (0, \infty)$

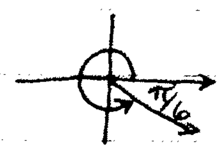
(34) $f^{-1}(x) = \frac{x-1}{2}$ or $\frac{1}{2}x - \frac{1}{2}$

(35) f is not 1-1, $\therefore$ inverse function DNE.

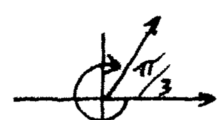
(39) $x = 5$ (41) $y - 5 = \frac{2}{3}(x - 0)$ $\Downarrow$ $y = \frac{2}{3}x + 5$

(43) $y = 7$ (45) $y = -\frac{3}{2}x + 3$ (59) a) $150°$ c) $\frac{473.4}{\pi}° \approx 150.688°$

(60) b) $-\frac{17\pi}{180}$ (61) a)



c)



(63) a) 0 c) -1 e) 1

(69) $\{\frac{\pi}{6}, \frac{11\pi}{6}\}$ (71) $\{\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}\}$ (73) $\{0, \frac{2\pi}{3}, \frac{4\pi}{3}\}$

(75) $\{0, \frac{\pi}{2}, \frac{3\pi}{2}\}$ ★(70) $\{\frac{\pi}{8}, \frac{7\pi}{8}, \frac{9\pi}{8}, \frac{15\pi}{8}\}$ (77) π (78) $-\frac{\pi}{4}$ (79) $\frac{\sqrt{5}}{2}$ (81) $\frac{12}{13}$

(87) $\frac{1}{5}$ (89) 1 (91) 4 (93) 2 (95) -1 (97) -5 (99) $-\frac{1}{6}$ (101) $\frac{1}{10}$ (103) 1 ★(102) $-\infty$ (105) $x = 0$ (107) $x = 0$, $x = 1$