CHRISTOPHER COLUMBUS

A Marist Brothers High School 1958

Summer Assignment Mathematics
Honors Calculus
Due Date: Wednesday, August 19, 2026

DIRECTIONS:

This summer assignment is for students who are enrolled in Honors Calculus. The concepts in this assignment are concepts you learned in Precalculus. Therefore, none of the questions should be unfamiliar to you. This assignment is due Wednesday, August 19, 2026 during class.

1. Print this summer assignment and show your work on paper. Your work must be neat, organized and legible. Work done in Notability or any other digital format will not be accepted.
2. You must show all your work to receive full credit. Answers without any work to support your answer will not receive credit.
3. Late summer assignments will not be accepted.
4. Your teacher will review the summer assignment in class so that you can ask questions and correct mistakes.
5. Students will be expected to take a mastery test that will consist of problems similar to those on the summer assignment.
6. Any student who does not earn a grade of at least 80% on the mastery test will be expected to do remediation problems and may be recommended to Calculus Accelerated.

Summer Review Packet for Students Entering HON Calculus

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. $f[g(-2)] =$ ________ 10. $g[f(m+2)] =$ ________ 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. $h[f(-2)] =$ ______ 15. $f[g(x-1)] =$ ______ 16. $g[h(x^3)] =$ ______

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

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

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

19. $f(x)=x^2+1$

20. $f(x)=x^3$

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

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

Find the x and y intercepts for each.

21. $y=2x-5$

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

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

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

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

Elimination Method

$2x^2 - 16x + 30 = 0$
$x^2 - 8x + 15 = 0$
$(x-3)(x-5) = 0$
$x = 3 \text{ and } x = 5$
Plug x=3 *and* $x = 5$ into one original

$3^2 - y^2 - 9 = 0$	$5^2 - y^2 - 9 = 0$
$-y^2 = 0$	$16 = y^2$
$y = 0$	$y = \pm 4$

Points of Intersection $(5,4)$, $(5,-4)$ *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 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.

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

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

Interval Notation

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

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

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

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

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

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

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

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

Equation of a line

Slope intercept form: $y=mx+b$

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

Vertical line: x = c (slope is undefined)

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).

Radian and Degree Measure

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

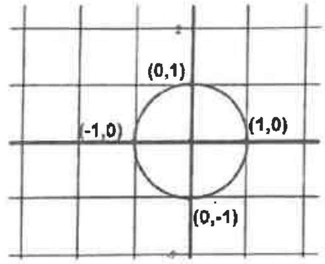
46. Convert to degrees: a. $\frac{5\pi}{6}$ b. $\frac{4\pi}{5}$ c. 2.63 radians

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

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.

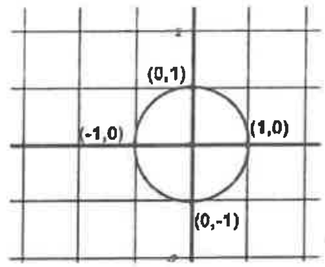
Example: $\sin 90^\circ = 1$ $\qquad$ $\cos\frac{\pi}{2} = 0$



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

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

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



Factor each completely.

49) $24x^3 + 3x^2 - 56x - 7$

50) $3p^2 + 29p - 10$

51) $80n^2 - 125$

52) $81x^3 + 375$

Divide. Write your answer in fraction form.

53) $(x^4 + 11x^2 + 11x + 9) \div (x + 1)$

54) $(6x^3 - 15x^2 - 30x + 13) \div (x^2 - 2x - 6)$

Solve each equation.

55) $27^{3n} = 9^{-n+2}$

Solve each equation. Round your answers to the nearest ten-thousandth.

56) $19^{7p} + 5 = 57.8$

Solve each equation.

57) $\log_2 5x = \log_2 (4x + 8)$

58) $5\log_{12}(b - 2) = 5$

Find all roots.

59) $x^3 - 8x^2 + 32x = 0$

60) $x^3 - 7x^2 + 10x = 0$

Formula Sheet (should be memorized)

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

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

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

Double Angle Identities: $\sin 2x = 2\sin x \cos x$

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

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

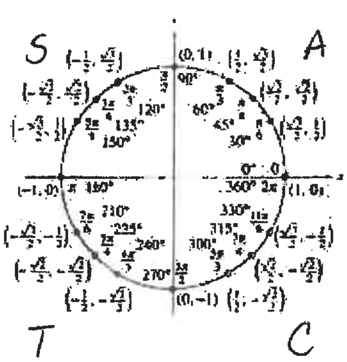
Change of base formula: $\log_a n = \dfrac{\log_b n}{\log_b a}$

[redacted]

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

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

Standard form: Ax + By + C = 0



You should also be able to do the following without hesitation:

SOLVE – any equation (i.e. linear, quadratic, exponential, logarithmic, trigonometric)

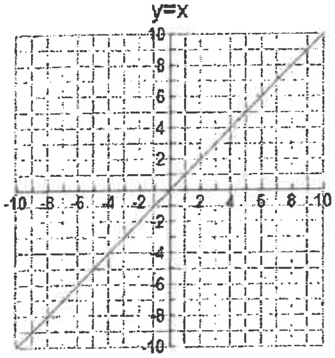
FACTOR – by all methods (i.e. difference of two squares, sum/difference of cubes, trinomials, perfect square trinomials)

DIVIDE polynomials using synthetic or long division

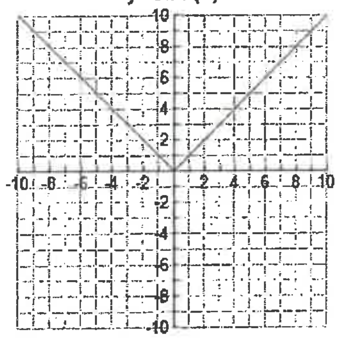
USE graphing calculator to graph functions, find intersection points, zeros, and values

Graphs You Should Know

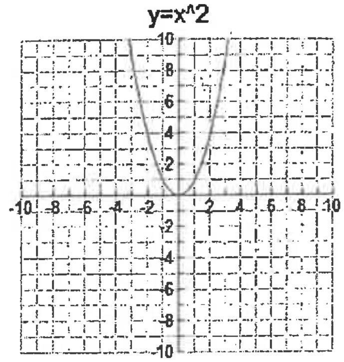
y=x



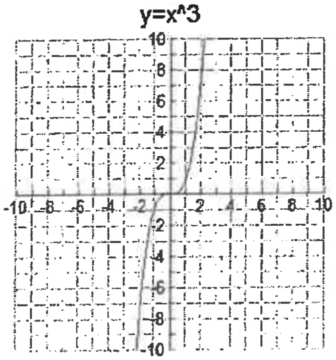
y=abs(x)



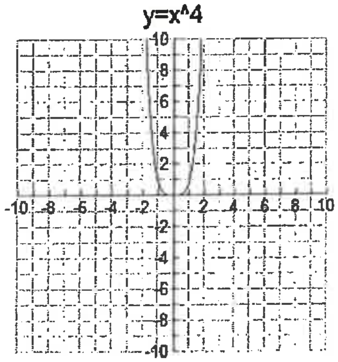
y=x^2



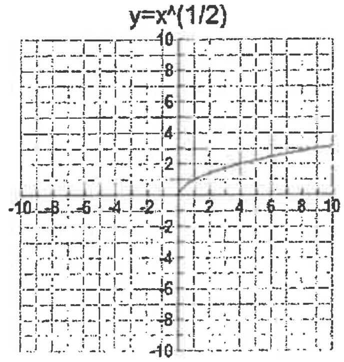
y=x^3



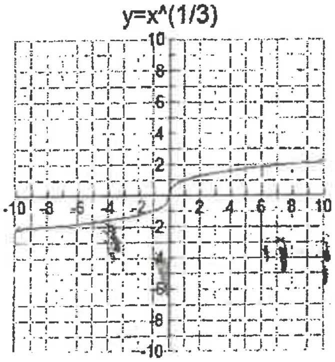
y=x^4



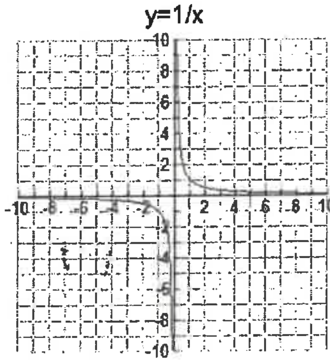
y=x^(1/2)



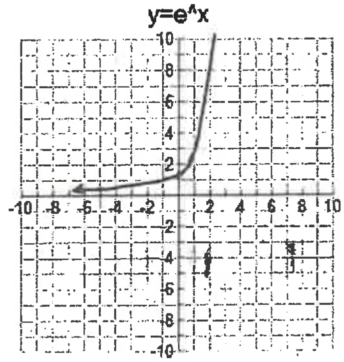
y=x^(1/3)



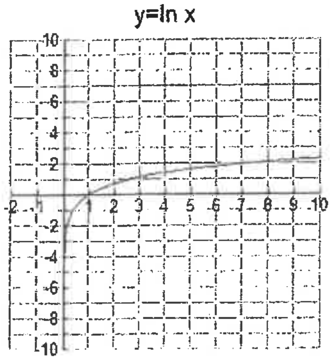
y=1/x



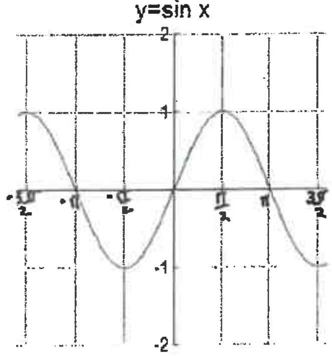
y=e^x



y=ln x



y=sin x



y=cos x