

Brushing up on Basic skills

To get you ready for

Calculus AB (*problems for BC)

NAME: _____

Directions: Use a pencil and the space provided next to each question to show all work. The purpose of this packet is to give a review of basic skills needed to be successful.

DO NOT USE A CALCULATOR!!

Items covered in this packet:

- ❖ Algebra topics
- ❖ Equations of a line
 - ❖ Factoring
 - ❖ Inequalities
- ❖ Pre-Calculus Topics
- ❖ Composition of Functions
- ❖ Logarithmic & Exponential Functions
 - ❖ Limits & Derivatives
 - ❖ Polar equations
 - ❖ Sequences & Series
 - ❖ Trigonometry Topics

ALL students will be expected to complete this review and will be responsible for the information contained. Teachers will administer a series of quizzes over this material in the first few weeks of school after reviewing in class. Pre AP and AP courses will test over review material within the first few weeks of school. **ALL** students should receive this review before the end of the previous school year from their math teacher or access a copy online over the summer. Copies of this review and answer keys are posted on the MHS Math Department website. If you find you need help at any time over the summer, visit the MHS Math Department page for a list of video tutorials and practice sites. Visit <http://www.alvinisd.net/domain/1489> or scan the code below.

We can't wait to see you next year!! Hoka Hey!

~MHS Mathematics Depart



Helpful resources:

<http://www.khanacademy.org>

<http://www.patrickjmt.com>

AP Calculus AB/BC SUMMER PACKET
FOR STUDENTS ENTERING CALCULUS

*For BC students only

ALGEBRA TOPICS

COMPLEX FRACTIONS & RATIONAL EXPRESSIONS

Perform the operations and simplify each of the following:

$$1) \frac{\frac{16}{x} - x}{x+4} =$$

$$2) \frac{\frac{2}{\frac{x^2}{10}}}{\frac{x^3}{x^3}} =$$

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

$$4) \frac{1 - \frac{2x}{3x-4}}{x + \frac{32}{3x-4}} =$$

$$5) \frac{1}{x+h} - \frac{1}{h} =$$

$$6) \frac{12x^{-4}y^3}{9xy^{-2}} =$$

$$7) \frac{2}{x^2-6x+5} - \frac{3}{x-5} =$$

$$8) \frac{\frac{x^4-16}{x-2}}{x^2-4} =$$

*9) Find A and B: $\frac{2x+1}{x^2+2x-8} = \frac{A}{x-2} + \frac{B}{x+4}$

EQUATION OF A LINE

Find the equation of the line using $y - y_1 = m(x - x_1)$:

10) slope = $-\frac{3}{5}$, y-intercept = 5

11) slope = -1, through the point (4,-2)

12) through points (-3,2) and (0,-1)

13) through point (2,0), parallel to $y = \frac{1}{3}x + 3y$

14) through (2,4), perpendicular to $y = 4x + 3$

FACTORING

Difference of two squares: _____

Sum/Difference of two cubes: _____

15) $(x+y)^3 + (x-y)^3 =$

16) $4x^2 + 48x + 80$

INEQUALITIES

Solve and write your answer in interval notation. No calculator

17) $\frac{(x+1)(x+4)}{(x-2)(x+2)} \leq 0$

18) $\frac{3x^2+2x-1}{x+1} > 0$

19) $\frac{3x-5}{x+2} \leq 2$

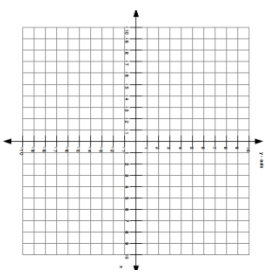
PRE-CALCULUS TOPICS

GRAPHING -- DOMAIN--RANGE--SYMMETRY--ASYMPTOTES--INTERCEPTS No Calculator

20) $y = x$

Domain:

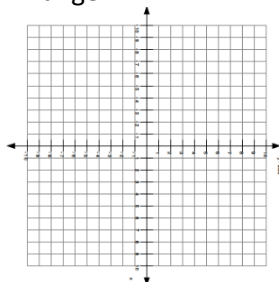
Range:



$y = x^2$

Domain:

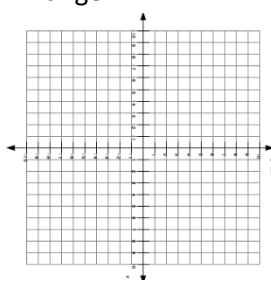
Range:



$y = x^3$

Domain:

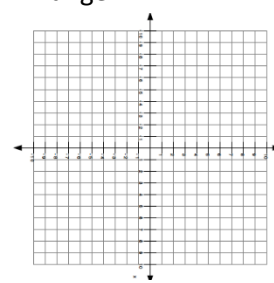
Range:



$y = 1/x$

Domain:

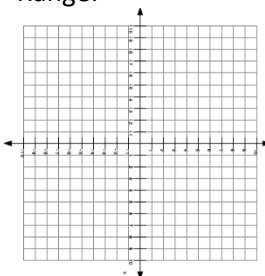
Range:



$y = 1/x^2$

Domain:

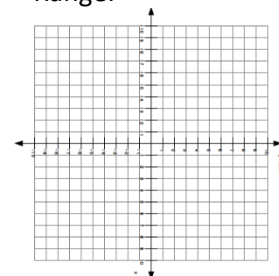
Range:



$y = |x|$

Domain:

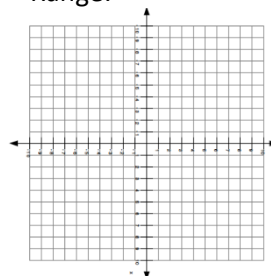
Range:



$y = \sqrt{x}$

Domain:

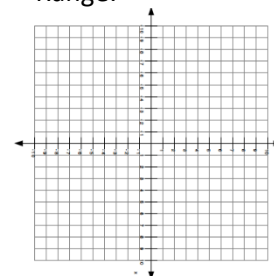
Range:



$y = \sin x$

Domain:

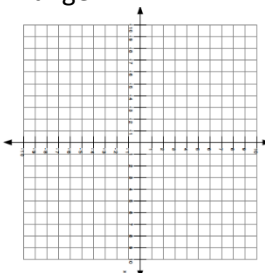
Range:



$y = \cos x$

Domain:

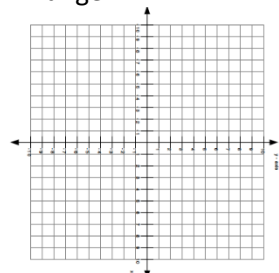
Range:



$y = a^x$

Domain:

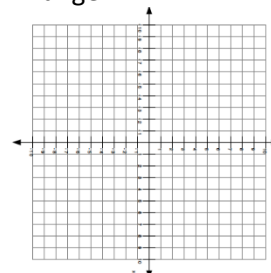
Range:



$y = \log_b x$

Domain:

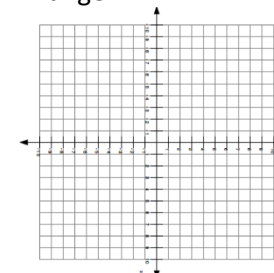
Range:



$y = \tan x$

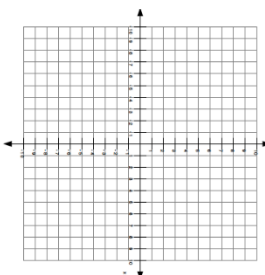
Domain:

Range:

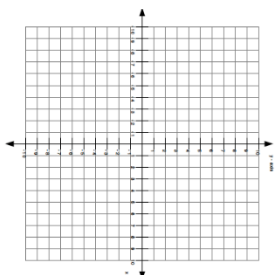


Find horizontal and vertical asymptotes, symmetry (x-axis, y-axis, origin) and intercepts. Sketch the graph. No Calculator

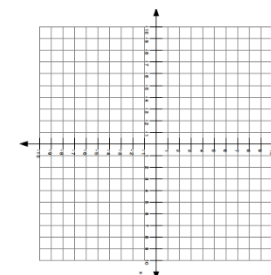
21) $y = \frac{1}{x-1}$



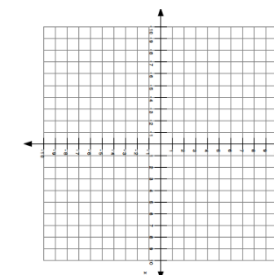
22) $y = \frac{1}{(x+2)^2}$



23) $y = \frac{2(x^2-9)}{x^2-4}$

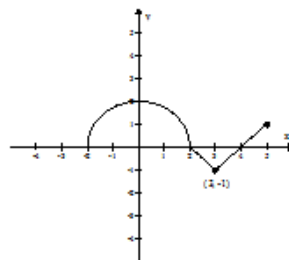
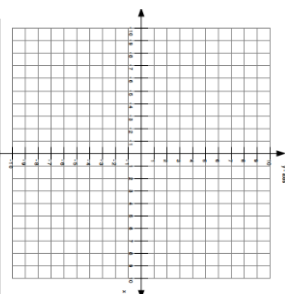


24) $y = \frac{x^2-2x+4}{x-1}$



25) Graph. No calculator

$$f(x) = \begin{cases} x - 1, & x < -1 \\ x^2, & -1 \leq x < 2 \\ -x + 1, & x \geq 2 \end{cases}$$



26) Write the equation of the piecewise function.

f(x)=

COMPOSITION OF FUNCTIONS

Use the table to evaluate the functions.

27) $f(g(1)) =$

28) $f(g^{-1}(2)) =$

29) $\frac{g(2)}{1+f^{-1}(1)} =$

x	1	2	3
f(x)	-2	1	7
g(x)	3	-1	2

LOGARITHMIC AND EXPONENTIAL FUNCTIONS

Definition of Logarithm: $\log_b y = x$ implies $b^x = y$ ($y > 0, b > 0, b \neq 1$)

Log properties: $\log_b MN = \log_b M + \log_b N$

$\log_b \frac{M}{N} = \log_b M - \log_b N$

$\log_b M^k = k \log_b M$

Use the formulas above to simplify the expressions. You must know these formulas.

30) $\ln e =$

$\ln 1 =$

$\ln \sqrt{e} =$

$e^{4 \ln 2} =$

$e^{y + \ln 2} =$

Solve for x:

31) $\frac{e^{x-4}e^{-x}}{3} = 1$

32) $\log_5 \sqrt{2x^2 - 3} = 1$

33) $\log_2(x - 1) + \log_2(x - 3) = 3$

34) $\ln x - \ln(2x - 5) = 0$

Expand the expressions using properties of the logarithms.

35) $\ln y^3(x - 2)^4 =$

36) $\log_4 \frac{4x}{y^4} =$

37) $\log\left(\frac{x\sqrt{y}}{z}\right) =$

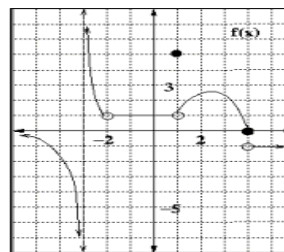
LIMITS

Use the figure to find the limit. No Calculator

38) $\lim_{x \rightarrow -2} f(x) =$

39) $f(1) =$

40) $\lim_{x \rightarrow -\infty} f(x) =$



Evaluate. Show supporting work (algebraic steps or sketch). No Calculator

41) $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x + 3} =$

42) $\lim_{x \rightarrow 0} \frac{1 - \frac{1}{4+x}}{\frac{1}{x}} =$

DERIVATIVES

Use the definition of the derivative to find the derivative. No Calculator You must know this formula.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

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

45) $f(x) = \sqrt{x + 4}$

44) $f(x) = \frac{2}{x-4}$

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

Use the power rule to find the derivative. No Calculator

47) $y = 12x^5 - 10x^3 - \frac{x}{2} + 10.5$

48) $y = (3x^2 - 6x)(x - 9)$

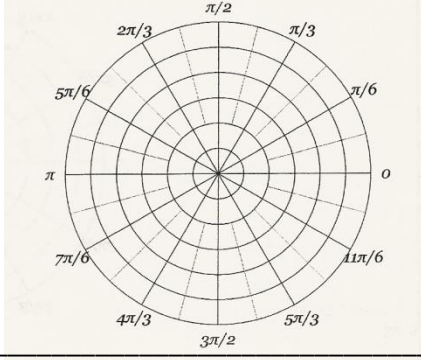
***POLAR EQUATIONS**

49) Convert to Cartesian form: $r = 6 \cos \theta$

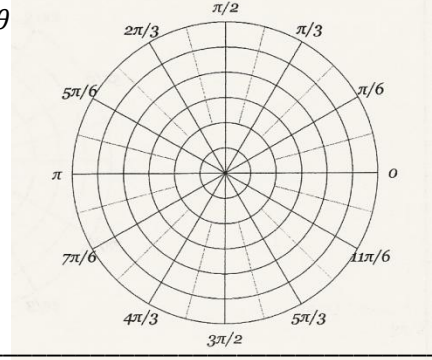
50) Convert to polar form: $4x + 3y = 7$

Identify each polar equation and give specific identifying features of each. Then graph each equation.

51) $r = 4 \sin \theta$



52) $r = 1 + \cos \theta$



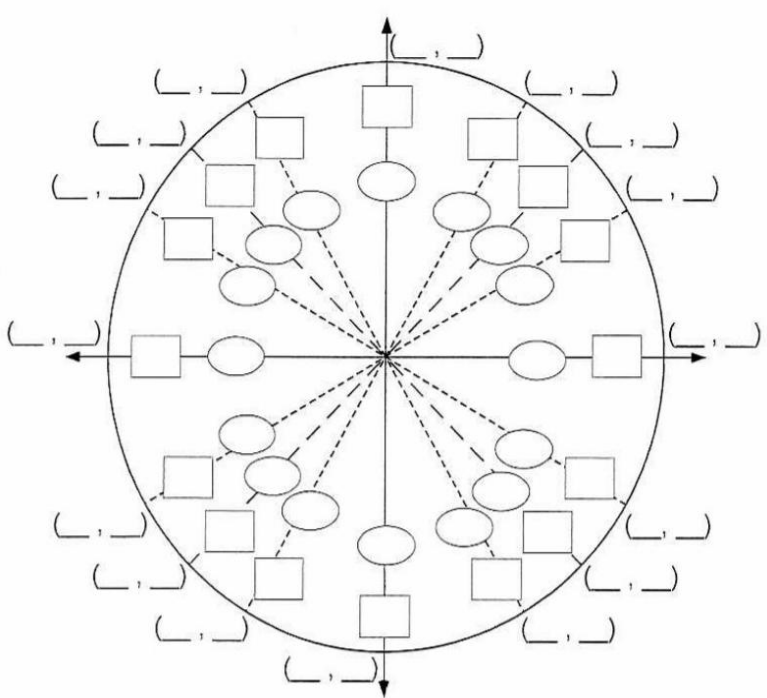
***SEQUENCES/SERIES**

53) If $r=0.2$ and $a_7=8$, what is the first term?

54) What is the sum of the infinite geometric series $3 + 1 + \frac{1}{3} + \frac{1}{9} \dots$?

TRIGONOMETRY TOPICS

55) UNIT CIRCLE



Solve the equations. Give the exact values in radians, $0 \leq x < 2\pi$. No Calculator

56) $2\cos^2 x = \cos x$

57) $3 - \tan^2 x = 2 \sec^2 x$

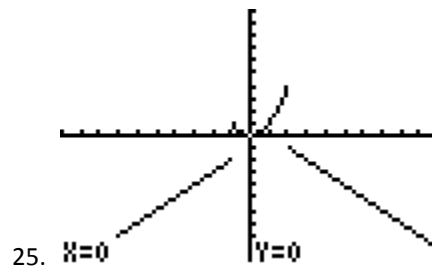
AP CALCULUS—SUMMER PACKET --ANSWERS

1. $\frac{4-x}{x}$
2. $\frac{x}{5}$
3. $\frac{2x}{5x+20}$
4. $\frac{x-4}{3x^2-4x+32}$
5. $\frac{x}{h(x+h)}$
6. $\frac{4y^4}{3x^5}$
7. $\frac{5-3x}{(x-5)(x-1)}$
8. $\frac{x^2+4}{x-2}$
9. $\frac{5}{6(x-2)} + \frac{7}{6(x+4)}$
10. $y = -\frac{3}{5}x + 5$
11. $y = -x + 2$
12. $y = -x - 1$
13. $y = \frac{1}{3}x - \frac{2}{3}$
14. $y = -\frac{1}{4}x + \frac{9}{2}$
15. $2x(x^2 + 3y^2)$
16. $4(x+2)(x+10)$
17. $[-4, -2) \cup [-1, 2)$
18. $(\frac{1}{3}, \infty)$
19. $(-\infty, 9]$
- 20.

f(x)	Domain	Range
y=x	R	R
y=x ²	R	y≥0
y=x ³	R	R
y=1/x	x≠0	y≠0

y=1/x ²	R	y>0
y= x	R	y≥0
y=√x	x≥0	y≥0
y=sinx	R	-1≤y≤1
y=cosx	R	-1≤y≤1
y=a ^x	R	y>0
y=log _b x	x>0	R
y=tanx	R	y≠π/2 ± nπ

21. H.a. y=0; v.a x=1; no symmetry
22. H.a. y=0; v.a x=-2; no symmetry
23. H.a. y=2; v.a x=±2; symmetry w.r.t the y-axis
24. H.a none; v.a x=1; no symmetry



25. $x=0$
26. $f(x) = \begin{cases} \sqrt{4-x^2}, & -2 \leq x < 2 \\ 2-x, & 2 \leq x \leq 3 \\ x-4, & x > 3 \end{cases}$
27. 7
28. 7
29. $-\frac{1}{3}$
30. 1, 0, 1/2, 16
31. $x=\ln 4$
32. $x = \pm\sqrt{14}$
33. $x=5$
34. $x=5$
35. $3 \ln y + 4 \ln x - 2$

36. $\log_4 4 + \log_4 x - 4 \log_4 y$

37. $\log x + \frac{1}{2} \log y - \log z$

38. DNE

39. 1

40. 0

41. -3

42. $-\frac{1}{16}$

43. $f'(x) = 2x - 3$

44. $f'(x) = \frac{-2}{(x-4)^2}$

45. $f'(x) = \frac{1}{2\sqrt{x+4}}$

46. $3x^2 + 4x - 1$

47. $f'(x) = 60x^4 - 30x^2 - \frac{1}{2}$

48. $9x^2 - 66x + 54$

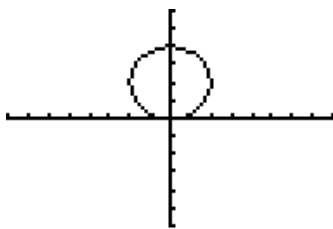
49. Multiply both sides by r . $(x - 3)^2 + y^2 = 9$

Circle with center (3,0) and radius 3

50. $r = \frac{7}{4\cos\theta + 3\sin\theta}$

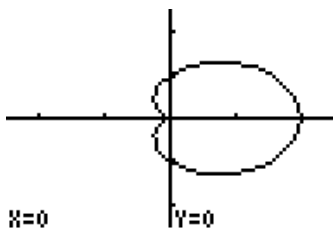
51. Circle on the y-axis that goes through the pole with

diameter 2;



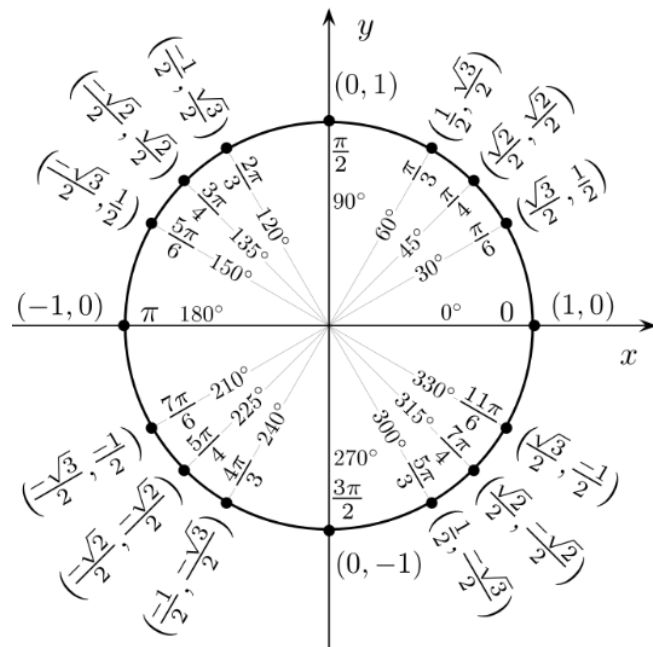
52. Cardioid goes through the pole; opens on the x-axis;

$-1 \leq \cos \vartheta \leq 1$ and $0 \leq r \leq 2$



53. 125,000

54. $\frac{9}{2}$



55.

56. $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{3}, \frac{5\pi}{3}$

57. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$