Welcome to Honors Pre-Calculus at Morton High School!

Dear Parents and Students,

Mathematics is a discipline that constantly builds on previous knowledge. Students entering Honors Pre-Calculus will be expected to recall and apply the material that they learned in Algebra II, Trigonometry, and Geometry. To help ensure your success in Honors Pre-Calculus, the high school mathematics department has compiled a list of problems that represent some of the most frequently used Algebra, Geometry, and Trigonometry concepts. Please take some time this summer to go over these problems. We have even included the solutions for you! When you return to school in the fall, be prepared to ask questions on any problems that have you stumped. There will be a test over this prerequisite material in the first few days of class to help determine your placement and readiness for Honors Pre-Calculus.

Pre-Calculus Review Test is scheduled for Friday, August 17, 2018. Your performance on this test will be a significant factor in determining if you maintain your placement in honors. Class time will be provided on Thursday, August 16th for questions.

The packet can be accessed through the district website. To find the review, go to the Morton High School website at
http://mhs.morton709.org/my-class/math
You will find a listing of all of our classes.
Please select Pre-Calculus Honors Summer Review

If you have any questions, contact Mrs. Durand at rosie.durand@mcusd709.org.

Have a wonderful summer!
The Mathematics Department
Morton High School

Note: For those students who will be purchasing a graphing calculator:
Please read the attached letter regarding graphing calculator requirements for MHS mathematics courses. You may send your student to school with the calculator's packaging intact for the math teacher to verify the correct calculator was purchased. CAS versions of the TI-Nspire are NOT allowed for students enrolled in Pre-Calculus.

FOR STUDENTS NEEDING TO PURCHASE A CALCULATOR:
MORTON HIGH SCHOOL Required Calculator: TI-Nspire CX

At Morton High School, all students use graphing calculators extensively in their math classes, whether they are in Algebra I through AP Calculus. This requirement has existed for a couple of years now; students are making great strides in mathematical understanding and performance as we continue to implement the use of the TI-Nspire CX. It is of critical importance that students obtain a calculator from the approved list because MHS math teachers have demonstration software for these specific devices, and it reduces the amount of class time spent on teaching students how to use the calculator.

In past years, Texas Instruments has offered schools a special opportunity to collect proof of purchase cards from students to be used towards a free TI-Nspire Navigator system or other TI-Nspire products. This system would allow us to wirelessly network graphing calculators to the teacher's computer, giving us the ability to let students demonstrate what they are doing to the class, receive document files from their teacher on their Nspire, and even use their calculator as a way to answer questions the teacher has posed to the class.

If you will be purchasing a new TI-Nspire CX (the latest version of the Nspire, which has a color screen) between now and the start of the 2018-19 school year, would you please return the entire "compare models" card that comes with the calculator to your child's math teacher? It will help us to obtain the Navigator system at no cost to the district. There is a picture of this card included on the next page. You must return the entire card, not just the "TI Points." **Do NOT purchase a calculator with CAS as part of its name.**

If your child will be using a hand me down TI-Nspire from an older sibling, such as the greyscale model, we will no longer be able to install the latest operating system nor will we be able to use this calculator with the Navigator system. It does, however, have most all of the functionality of the CX and can still be used with much success.

DO **NOT** PURCHASE THE TI-NSPIRE **CAS** OR TI-NSPIRE CX-**CAS**. Although the CAS is allowed on the SAT, these calculators are not allowed on the ACT and thus not allowed for students enrolled in MHS courses other than AP Calculus.

Thanks for helping us make sure your child receives the best possible math education with the latest tools available.

If the purchase of a graphing calculator will place an undue financial burden on your family, please contact your counselor or your math teacher.

Be sure to save the <u>entire card</u> with the TI Technology points and turn it in to any math teacher! With enough collected, the department will be able to earn software for use with your students!

The technology students need.
The value you want.

Get TI-Nspire™ CX handhelds for math and science learning without impacting the school budget.

Many schools and districts have adopted a student-purchase program to help bring handheld technology into their math and science classrooms.

They have made this shift to help ease the pressure of decreasing budgets while offering competitive, technology-rich classrooms. Providing the best tools for student success is a top priority for every educator.

Research[†] findings

When students own a handheld for use in class and at home, they are able to develop a deeper understanding of concepts. **Research also shows improvements in scores on national, state and school-level tests.**

†Learn more at education.ti.com/research.

Longevity of use

A handheld purchase offers years of use – from middle grades through college – in a wide range of subjects, including:

Middle Grades Math	Geometry	Statistics	Biology
Pre-Algebra	Precalculus	Calculus	Chemistry
Algebra 1 & 2	Trigonometry		Physics

Long-term support

Curricular content, professional development and training, free technical support, software updates and parent communications are a few of the many educator support resources that are a staple of TI educational technology.

PERMITTED ON TESTING
SAT ACT AP IB

TI-Nspire™ CX handheld
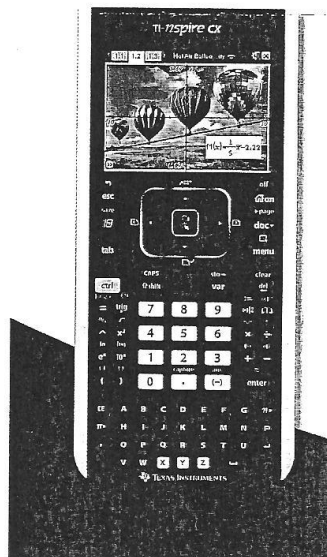
Handheld/software bundle

Each TI-Nspire CX and TI-Nspire™ CX CAS handheld purchased at a retail or retail online store comes together with TI-Nspire™ Student Software (PC or Mac®) for home use. Students can learn with the handheld in class and the software on a desktop or laptop computer at home or college. Handheld and software functionality are virtually identical.

Exam acceptance

The TI-Nspire™ CX handheld and the TI-Nspire™ CX CAS handheld** are permitted on a growing number of state math and science tests and college entrance exams that include:

- » SAT*
- » ACT®
- » PSAT/NMSQT*
- » AP*
- » IB®
- » Praxis™

**The TI-Nspire CX CAS handheld is not permitted on the ACT or IB exams.

Free test prep and more with student purchase

Students who purchase a TI-Nspire CX or TI-Nspire CX CAS handheld can download free SAT* and ACT® practice questions from The Princeton Review™ for review on their handheld.

Enhanced graphing and computer features for the TI-Nspire CX handheld

- » Bright, backlit, full-color screen
- » Touchpad enables easy navigation through screens and menus
- » Thin, lightweight design
- » Ability to upload and view photos and images
- » Multiple representations on a single screen
- » Ability to save files
- » Claimants must send in the bottom half of the back of the retail package card for each of the 60 packages Tech Rewards Points (TRP) labels, as in this example:

COMPARE MODELS	TI-84 Plus	TI-84 Plus Silver Edition	TI-Nspire™ with Touchpad	TI-Nspire™ CX	TI-89 Titanium
Display Resolution	96 x 64	96 x 64	320 x 240	320 x 240	160 x 100
Available Memory (ROM / RAM)	480 KB / 24 KB	1.5 MB / 24 KB	15 MB	100 MB	2.7 MB / 188 KB
Rechargeable Battery			Optional	Included	
Removeable Faceplates Available		■			
Computer Algebra System (CAS)					■
Engineering Applications					■
Interchangeable TI-84 Plus Keypad Available			■		
USB Cable Included	■	■	■	■	■
Software Included			■	■	
Import Images**			■	■	
Save your work			■	■	
Color, Backlit Display				■	

*SAT and AP are trademarks of the College Board, and ACT is a trademark of ACT, Inc., neither of which were involved in the production of, nor do they endorse this product. For more information on college entrance exams, visit: www.sat.org and www.act.org.

TI Technology Rewards Program
50 POINTS

Includes: calculator, slide case, USB cable, 1 TI-Nspire Rechargeable Battery and 1 wall adapter

** TI-Nspire supports the following image types: .jpg, .jpeg, .bmp, .png.

1-year limited warranty
Made in China
© 2012 Texas Instruments
N3/BC/7L1/A   010112

QUESTIONS?
education.ti.com/support
or 1-800-TI CARES

Manufactured for Texas Instruments,
Dallas, TX ·

TI-Nspire™ CX

0 33317 20395 6

Pre-Calculus Honors Summer Review Packet

The material covered in this packet is a review of topics taught in Algebra I, Algebra II, and/or Trigonometry. Pre-Calculus students need to be proficient in the following topics. A test over the review materials will be given during the first week of class.

Linear Equations: Be certain to know all of the below formulas.

Midpoint $\left(\dfrac{x_1+x_2}{2}, \dfrac{y_1+y_2}{2}\right)$	Distance $d = \sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$
Slope $\dfrac{y_1-y_2}{x_1-x_2}$	Slope-intercept form $y = mx + b$
Standard form $Ax + By = C$	$\parallel$ Lines = same slope, $\perp$ lines = slopes opp recip

Find the length of the segment with the given endpoints. Find the midpoint of the segment.

1. (3, 3), (15, 12)   2. (6, 4), (6, – 10)   3. (– 2, – 1), (4, 9)

Use the distance formula and/or the midpoint formula to solve the problems below.

4. Plot $A(1, 7)$, $B(3, 5)$, $C(4, -1)$, $D(2, 1)$. Use the distance formula to show that the opposite sides of quadrilateral $ABCD$ are equal in length. What kind of figure is $ABCD$?

5. Plot $A(5, 1)$, $B(7, -1)$, $C(1, -3)$, $D(-1, -1)$. Use the midpoint formula to show that the diagonals of quadrilateral $ABCD$ have the same midpoint.

Find the slope of the line containing the following pairs of points.

6. (2, 0), (3, 6)   7. (-2, 6), (2, -2)   8. $(a, -b)$, $(-b, a)$

Find the equation of the line using the information provided. Give answer in slope-intercept form.

9. slope = 4 and y-intercept = – 2.   10. $m = -\frac{1}{2}$, $b = 5$

11. slope = 2 and passing through (1, 4)   12. slope = 3 passing through (– 3, 4)

13. passing through (5, 4) and (7, 3)   14. passing through (4, 0) and (4, – 2)

15. passing through (1, 2) and parallel to $y = 3x - 2$

16. passing through (1, 2) and perpendicular to $y = 3x - 2$

17. passing through (3, 1) and parallel to $2x + 3y = 12$

18. passing through (3, 1) and perpendicular to $2x + 3y = 12$

Irrational Numbers: Be able to add, subtract, multiply, divide, and simplify irrational numbers.

Simplify

19. $\sqrt{72}$

20. $5\sqrt{360}$

21. $2\sqrt{288}$

22. $\sqrt{400}$

23. $\left(\sqrt{15}\right)\left(\sqrt{10}\right)$

24. $\left(5\sqrt{12}\right)\left(2\sqrt{18}\right)$

25. $\sqrt{32}\cdot\sqrt{8}$

26. $\left(3\sqrt{2}\right)^2$

27. $\left(2-\sqrt{8}\right)+\left(6+\sqrt{18}\right)$

28. $\left(2-\sqrt{36}\right)-\left(5-\sqrt{4}\right)$

29. $\left(5-\sqrt{2}\right)\left(-3+\sqrt{2}\right)$

30. $\left(1-\sqrt{5}\right)\left(3-\sqrt{3}\right)$

31. $\left(\sqrt{7}+1\right)\left(\sqrt{7}-1\right)$

32. $\dfrac{3}{\sqrt{6}}$

33. $\dfrac{2+\sqrt{3}}{2-\sqrt{3}}$

34. $\dfrac{5}{\sqrt{7}+\sqrt{2}}$

35. $\dfrac{\sqrt{18}+\sqrt{10}}{\sqrt{2}}$

Complex Numbers: Be able to add, subtract, multiply, divide, and simplify complex numbers.

$i=\sqrt{-1}$ $i^2=-1$ $i^3=-i$ $i^4=1$

Conjugates: $a+bi$ and $a-bi$ where a is the real component, bi is the imaginary component

Simplify

36. i^{35}

37. i^{1089}

38. i^{-5}

39. i^{-193}

40. $\sqrt{-16}$

41. $\sqrt{-45}$

42. $\sqrt{-3}\cdot\sqrt{-12}$

43. $\left(5\sqrt{-36}\right)\left(2\sqrt{-4}\right)$

44. $\left(2-3i\right)+\left(6+5i\right)$

45. $\left(2-i\right)-\left(5-4i\right)$

46. $\left(5-2i\right)+\left(-2+\sqrt{-9}\right)$

47. $\left(1-4i\right)\left(3-2i\right)$

48. $\left(7+i\right)\left(7-i\right)$

49. $\dfrac{3}{i}$

50. $\dfrac{2+i}{2-i}$

51. $\dfrac{1}{a+bi}$

52. $\dfrac{5}{3-7i}$

53. $\dfrac{2+i\sqrt{5}}{3-i\sqrt{5}}$

Factoring: Be able to factor polynomials.

Factor completely.

54. $x^2-5x-14$

55. $x^2-3xy-40y^2$

56. $2x^2-27x+36$

57. $4x^2+12x+9$

58. $16c^2-49$

59. $28x^2+13x-6$

60. $3x^5+8x^4-16x^3$

61. x^4-1

62. $5x^2-25x$

63. $9x^2-1$

Equations: Solve the equations below. Provide both real and complex solutions.

$$\boxed{\text{Quadratic Formula:} \qquad \text{For } ax^2 + bx + c = 0, \qquad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$$

64. $3t - 4 = 8$

65. $4 - 3y = 2(y + 4)$

66. $\frac{1}{2}x + \frac{1}{3} = 1$

67. $2(3 - 4z) - 5(2z + 3) = z - 17$

68. $\frac{2x - 3}{4} + 5 = 3x$

69. $\frac{t + 5}{8} - \frac{t - 2}{2} = \frac{1}{3}$

70. $\sqrt{x + 5} = 3$

71. $2\sqrt{5 - x} + 7 = 11$

72. $|x| = 9$

73. $|x + 4| = 15$

74. $x^2 = 8$

75. $\frac{1}{2}x^3 = 4$

76. $x^2 + 4x - 21 = 0$

77. $x^2 - 12x = -20$

78. $6x^2 + 49x - 45 = 0$

79. $6x - 5 = 2x^2$

80. $x^2 + 5x + 1 = 0$

81. $5x^2 + 8x + 4 = 0$

Inequalities: Solve inequalities in one variable.

Solve the inequality and graph the solution on a number line.

82. $x - 4 < 2$

83. $\frac{3x - 2}{5} > -1$

84. $5 - 2x \geq 11$

85. $0 \leq 2x + 5 \leq 8$

86. $4x + 2 \leq 3 \text{ or } x + 7 > 9$

87. $|x + 5| < 4$

Trigonometry: Know your exact values for each of the six trig functions evaluated at multiples of 30º, 45º, 60º, and 90º. Be able to work with both degrees and radians.

Convert to radians: multiply by $\dfrac{\pi}{180°}$.   Convert to degrees: multiply by $\dfrac{180°}{\pi}$

$0° = 0, \quad 30° = \dfrac{\pi}{6}, \quad 45° = \dfrac{\pi}{4}, \quad 60° = \dfrac{\pi}{3}, \quad 90° = \dfrac{\pi}{2}, \quad 180° = \pi, \quad 270° = \dfrac{3\pi}{2}, \quad 360° = 2\pi$

$\sin 0 = 0 \quad \sin\dfrac{\pi}{6} = \dfrac{1}{2} \quad \sin\dfrac{\pi}{4} = \dfrac{\sqrt{2}}{2} \quad \sin\dfrac{\pi}{3} = \dfrac{\sqrt{3}}{2} \quad \sin\dfrac{\pi}{2} = 1 \quad \sin\pi = 0 \quad \sin\dfrac{3\pi}{2} = -1 \quad \sin 2\pi = 0$

$\cos 0 = 1 \quad \cos\dfrac{\pi}{6} = \dfrac{\sqrt{3}}{2} \quad \cos\dfrac{\pi}{4} = \dfrac{\sqrt{2}}{2} \quad \cos\dfrac{\pi}{3} = \dfrac{1}{2} \quad \cos\dfrac{\pi}{2} = 0 \quad \cos\pi = -1 \quad \cos\dfrac{3\pi}{2} = 0 \quad \cos 2\pi = 1$

Convert to radians.

88. 240º

89. -540º

90. 330º

Convert to degrees.

91. $\dfrac{5\pi}{3}$

92. $\dfrac{7\pi}{4}$

93. $\dfrac{\pi}{9}$

Give the exact value of each of the following.

94. cos 315º

95. sin 240º

96. sin 210º

97. tan 270º

98. sec 45º

99. csc 150º

100. $\sin\dfrac{2\pi}{3}$

101. $\cos\dfrac{5\pi}{6}$

102. $\sin 5\pi$

103. $\cos(-3\pi)$

104. $\sin\dfrac{7\pi}{3}$

105. $\tan\dfrac{\pi}{4}$

106. $\csc\dfrac{11\pi}{6}$

107. $\cot\dfrac{5\pi}{4}$

108. $\sec 0$

109. cot 0

110. $\sin 15\pi$

Be able to perform the following tasks on your graphing calculator. If you need help, you can search the Texas Instruments website for help guides.
- Graph a function and adjust the viewing window
- Calculate the zeros of a graphed function
- Find the intersection points of two graphed functions
- Find the maximum or minimum value of a graphed function
- Change mode from degrees to radians and from radians to degrees

Answers to Review Problems

1. $15 ; (9, 1\tfrac{1}{2})$

2. $14 ; (6,-3)$

3. $2\sqrt{34} ; (1,4)$

4. $AB=CD=\sqrt{8}$ and $AD=BC=\sqrt{37}$; parallelogram

5. mdpt. $\overleftrightarrow{AC}=(3,-1)$ and mdpt. $\overleftrightarrow{BD}=(3,-1)$

6. 6

7. -2

8. $\dfrac{a+b}{-b-a}=-1$

9. $y=4x-2$

10. $y=-\tfrac{1}{2}x+5$

11. $y=2x+2$

12. $y=3x+13$

13. $y=-\tfrac{1}{2}x+1\tfrac{3}{2}$

14. $x=4$

15. $y=3x-1$

16. $y=-\tfrac{1}{3}x+\tfrac{7}{3}$

17. $y=-\tfrac{2}{3}x+3$

18. $y=\tfrac{3}{2}x-\tfrac{1}{2}$

19. $6\sqrt{2}$

20. $30\sqrt{10}$

21. $24\sqrt{2}$

22. 20

23. $5\sqrt{6}$

24. $60\sqrt{6}$

25. 16

26. 18

27. $8+\sqrt{2}$

28. -7

29. $-17+8\sqrt{2}$

30. $3-\sqrt{3}-3\sqrt{5}+\sqrt{15}$

31. 6

32. $\dfrac{\sqrt{6}}{2}$

33. $7+4\sqrt{3}$

34. $\sqrt{7}-\sqrt{2}$

35. $3+\sqrt{5}$

36. $-i$

37. i

38. $-i$

39. $-i$

40. $4i$

41. $3i\sqrt{5}$

42. -6

43. -120

44. $8+2i$

45. $-3+3i$

46. $3+i$

47. $-5-14i$

48. 50

49. $-3i$

50. $\dfrac{3+4i}{5}$

51. $\dfrac{a-bi}{a^2+b^2}$

52. $\dfrac{15+35i}{58}$

53. $\dfrac{1+5i\sqrt{5}}{14}$

54. $(x-7)(x+2)$

55. $(x+5y)(x-8y)$

56. $(2x-3)(x-12)$

57. $(2x+3)^2$

58. $(4c-7)(4c+7)$

59. $(7x-2)(4x+3)$

60. $x^3(3x-4)(x+4)$

61. $(x+1)(x-1)(x^2+1)$

62. $5x(x-5)$

63. $(3x-1)(3x+1)$

64. $t=4$

65. $y=\dfrac{-4}{5}$

66. $x=\dfrac{4}{3}$

67. $z=\dfrac{8}{19}$

68. $x = \dfrac{17}{10}$

69. $t = \dfrac{31}{9}$

70. $x = 4$

71. $x = 1$

72. $x = \pm 9$

73. $x = -19, \; 11$

74. $x = \pm 2\sqrt{2}$

75. $x = 2$

76. $x = 3, -7$

77. $x = 2, 10$

78. $x = \dfrac{5}{6}, -9$

79. $x = \dfrac{3 \pm i}{2}$

80. $x = \dfrac{-5 \pm \sqrt{21}}{2}$

81. $x = \dfrac{-4 \pm 2i}{5}$

82. $x < 6$

83. $x > -1$

84. $x \le -3$

85. $\dfrac{-5}{2} \le x \le \dfrac{3}{2}$

86. $x \le \dfrac{1}{4} \text{ or } x > 2$

87. $-9 < x < -1$

88. $\dfrac{4\pi}{3}$

89. -3π

90. $\dfrac{11\pi}{6}$

91. $300°$

92. $315°$

93. $20°$

94. $\dfrac{\sqrt{2}}{2}$

95. $\dfrac{-\sqrt{3}}{2}$

96. $\dfrac{-1}{2}$

97. No solution

98. $\sqrt{2}$

99. 2

100. $\dfrac{\sqrt{3}}{2}$

101. $\dfrac{-\sqrt{3}}{2}$

102. 0

103. -1

104. $\dfrac{\sqrt{3}}{2}$

105. 1

106. -2

107. 1

108. 1

109. No solution

110. 0