OVERVIEW:

The following assignment contains concepts that are previously covered in prior math courses that are relevant to your up-coming Calculus school year!

This assignment will NOT be collected nor graded. The assignment should be used as a tool to recall past concepts and to stay fresh with the accurate steps to a successful year in Calculus!

There WILL be an assessment within the first 2 weeks of returning to school on the concepts you will find throughout this assignment with limited classroom time devoted to re-teaching these concepts.

If you are in need of a review of certain topics, please consult the websites dedicated to the Khan Academy and Regents Prep.

Regents Prep


Khan Academy

http://www.khanacademy.org/math/trigonometry
Solve each equation. Remember to check for extraneous solutions.

1. \( x^2 - 6x = 16 \)  
2. \( 81x^2 - 169 = 0 \)  
3. \( 5n^2 - 10n + 7 = 3n \)

4. \( \frac{12}{t} + t - 8 = 0 \)  
5. \( \frac{9}{b + 5} = \frac{3}{b - 3} \)  
6. \( \frac{t + 4}{t} + \frac{3}{t - 4} = \frac{-16}{t^2 - 4t} \)

Simplify each function as much as possible. State any restrictions on the domain.

7. \( f(x) = \frac{6x^5 - 9x^3 + 12x^2}{15x^4 - 3x^3} \)  
8. \( f(x) = \frac{3x^3 + 5x - 2}{x^3 - 4x} \)  
9. \( f(x) = \frac{x^2 + 10x + 9}{x^2 - 9} \)

Expand each expression by writing as a polynomial in standard form.

10. \( (x + 4)^3 \)  
11. \( (x - 2)^4 \)

Factor each expression completely.

12. \( 2x^2 - 20x + 48 \)  
13. \( 2x^2 - x - 36 \)  
14. \( 12x^2 + 32x + 5 \)

15. \( x^4 + 3x^3 - 25x^2 - 75x \)  
16. \( 3x^3 - 8x^2 + 21x - 56 \)  
17. \( 3x^5y(x - 1) + 2x^2y^2(x - 1) \)

18. \( 3x^4 + 25x^2 - 18 \)  
19. \( 7x^4 - 140x^2 + 700 \)  
20. \( x^4 - 1 \)

21. \( \sin^2 x + 3 \sin x + 2 \)  
22. \( 3 \tan^2 x - 4 \tan x + 1 \)  
23. \( 2 \cos^2 x \csc x - \csc x \)
Evaluate each expression based on the unit circle. All answers should be exact. (Some expressions will be undefined.)

24. \(\tan 2\pi\)  
25. \(\cos \frac{\pi}{6}\)  
26. \(\sin \frac{5\pi}{4}\)  
27. \(\tan \frac{4\pi}{3}\)  
28. \(\cos 0\)

29. \(\sec \frac{5\pi}{3}\)  
30. \(\csc \pi\)  
31. \(\cot \frac{7\pi}{4}\)  
32. \(\csc \frac{11\pi}{6}\)  
33. \(\sin \frac{3\pi}{2}\)

34. \(\sin \frac{13\pi}{3}\)  
35. \(\cos \frac{7\pi}{2}\)  
36. \(\tan \frac{15\pi}{4}\)  
37. \(\cos \frac{23\pi}{6}\)  
38. \(\csc 15\pi\)

39. \(\cos \left(-\frac{11\pi}{4}\right)\)  
40. \(\tan \left(-\frac{19\pi}{3}\right)\)  
41. \(\sin \left(-\frac{9\pi}{2}\right)\)  
42. \(\tan \left(-\frac{21\pi}{6}\right)\)  
43. \(\sec \left(-\frac{7\pi}{6}\right)\)

**Simplify each expression using trigonometric identities (Pythagorean, reciprocal, quotient, and double-angle identities).**

44. \(\frac{\sec x}{\tan x}\)  
45. \(\frac{\cot \theta}{\cos \theta}\)  
46. \(\frac{\sin(x + 2\pi)}{\cos x}\)

47. \((1 + \cos \theta)(\csc \theta - \cot \theta)\)  
48. \(\sin \beta \cos \beta \sec \beta \cot \beta\)  
49. \((1 - \sin^2 \alpha) \sec \alpha\)

50. \(\tan x \cos^2 x - \tan x\)  
51. \(\cos^2 x (\sec^2 x - 1) + \sin^2 x (\cot^2 x - 1)\)

52. \(\frac{\sin 2x}{\sin x}\)  
53. \(2 \sin \theta \cos \theta + 5 \sin 2\theta\)

**Use properties of exponents and logarithms to simplify each expression.**

54. \(\ln 1\)  
55. \(\ln e^{3x-8}\)  
56. \(\ln 5x - \ln 3x\)  
57. \(\frac{1}{4} \ln 16x^4\)
Use a graphing calculator to answer the following questions.

66. \( f(x) = 3x^5 - 19x^3 + 12x^2 - 7 \)
   
a. Find the x-intercepts of the function.
   
b. Find all maxima and minima of the function.
   
c. For what value(s) of \( x \) does \( f(x) = 7000 \)?

67. \( f(x) = 5x^3 - 194x^2 - 244x + 160 \)
   
a. Find the x-intercepts of the function.
   
b. Find all maxima and minima of the function.
   
c. For what value(s) of \( x \) does \( f(x) = 3 \)?

68. Find all values of \( x \) for which \( \ln(7x - 3) + 2 = \sqrt{x^2 + 9} \)

69. Find all values of \( x \) for which \( \sqrt[3]{x} = \cos x \)

Write the equation of each line using point-slope formula.

70. \( m = \frac{2}{3} \), through \((7, -2)\)

71. through \((-2, 3)\) and \((1, 9)\)

72. \( m = -\frac{5}{4} \), \( f(3) = -1 \)

Set up and simplify the difference quotient for each function.

\[
\text{difference quotient of } f(x) = \frac{f(x + h) - f(x)}{h}
\]

73. \( f(x) = 3x - 5 \)

74. \( f(x) = x^2 + 4 \)

75. \( f(x) = 3x^2 - 8x \)
76. \( f(x) = x^2 + 6x - 2 \)  
77. \( f(x) = x^3 + 7x \)

Use the given functions to evaluate each function composition.

\[
\begin{align*}
  f(x) &= \sqrt{x - 3} \\
  g(x) &= x^2 - 7x + 3 \\
  h(x) &= 2x + 11
\end{align*}
\]

78. \( f(g(x)) \)  
78. \( g(h(x)) \)  
79. \( h(g(x)) \)  
80. \( h(f(12)) \)

Determine functions \( g(x) \) and \( f(x) \) so that each function is \( h(x) = f(g(x)) \).

81. \( h(x) = \frac{12}{3x - 5} \)  
82. \( h(x) = \sqrt[3]{5x^2 - 5x} \)  
83. \( h(x) = (3x + 2)^{\frac{1}{2}} - (3x - 2)^{\frac{3}{2}} \)