SUMMER ASSIGNMENT FOR FUNCTIONS/TRIGONOMETRY

Bring to school the 1st day of class!

This summer assignment is designed to prepare you for Functions/Trigonometry. Nothing on the summer assignment is new. Everything is a review of topics students learned in Algebra I & II and Geometry. If you want to be successful during Functions/Trig, you must be able to understand and apply this information throughout next year. The assignment may be completed with another student but be certain that YOU understand how to complete every problem. The answers are available online through GroupFusion. Be sure to check every problem. Neatly show all work for each problem, using a pencil. Calculators are only necessary for #28 – 33, and should not be relied upon for the remainder of the assignment. During the second week of school, you will have a test covering all of the material from the summer assignment.

If you need to review these topics or see examples, we recommend the website www.purplemath.com/modules/index.htm, which lists many Algebra review topics. If, after reviewing, you need further assistance, please e-mail Mr. Douglas at douglasRP@pwcs.edu, Mr. Keskel at KESKELK@pwcs.edu, Mr. Bicknell at BickneHC@pwcs.edu, or Mrs. Gellios at gelliosj@pwcs.edu, with questions.

Properties of Exponents:

\[ a x^{-n} = \frac{a}{x^n} \quad (x^m)^n = x^{mn} \]

\[(x^m)(x^n) = x^{m+n} \quad x^0 = 1 \]

PurpleMath Topics:

Beginning Algebra Topics:
- Exponents:
  - Basic Rules
  - Negative Exponents
- Simplifying with Exponents

Simplify the following expressions using the properties above. Leave no negative exponents.

1. \(4w^{-1}\)

5. \(\frac{a^{-5}}{64p^{11}}\)

2. \((3w^{-2})(5w^8)\)

6. \(\frac{64x^{-7}}{80y^{-2}t^5}\)

3. \((2x^2y^{-1}z)^{-3}\)

7. \(\frac{12x^6y^{-3}z^5}{13x^{-4}y^{-4}z^8}\)

4. \((22x^4)^0 \cdot (6x^0)^2\)
Rational Exponents:
\[ \sqrt[n]{x^m} = x^{\frac{m}{n}} \]

PurpleMath Topics:
Beginning Algebra Topic:
- Exponents:
  Fractional Exponents

Simplify the following expressions using the property above. Express radicals as fractional exponents.

8. \( \sqrt[3]{m} \)

10. \( \sqrt[5]{t^5} \)

9. \( \sqrt[5]{n^5} \)

11. \( \frac{15}{5 \sqrt{b^6}} \)

Complex Numbers:
\( \sqrt{-1} = i \)

PurpleMath Topic:
Advanced Algebra Topics:
- Complex Numbers

Simplify the following expressions using imaginary numbers.

12. \( \sqrt{-25} \)

13. \( \sqrt{-8} \)

14. \( i^2 \)

15. \( 12y^2 - 1 = 2y \)

16. \( c^2 + c + 72 = 0 \)

17. \( 4w^2 + 11w = -6 \)

Quadratic Formula:
\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

PurpleMath Topic:
Intermediate Algebra Topics:
- Quadratic Formula
Solve the following equations using factoring. Show factored equation and give all solutions (real and imaginary).

18. \(14x^2 - 7x = 0\)

19. \(x^2 - 9 = 0\)

20. \(x^3 - 216 = 0\)

21. \(9x^2 - 12x + 4 = 0\)

22. \(3x^3 + 1029 = 0\)

23. \(x^4 - 256 = 0\)

24. \(p^3 - 2p^2 - 35p = 0\)

25. \(p^2 - 19p + 90 = 0\)

26. \(12x^2 + 16x - 3 = 0\)

27. \(24n^2 - 78n - 21 = 0\)
Solve for the unknown in each of the figures below. Give answers accurate to four decimal places.

28. \[ \text{3 in.} \quad 4 \text{ in.} \]

29. \[ \text{3 ft} \quad 4 \text{ ft} \]

30. \[ \text{15 m} \quad 33^{\circ} \]

31. \[ \text{17 mm} \]

32. \[ \text{9 yd} \quad 26^{\circ} \]

33. \[ \text{51 cm} \quad 68 \text{ cm} \]
For each of the following sets of points, find:

a) the slope
b) the equation of the line that fits these points
c) the midpoint

34. \((-2, 8) \quad (6, 0)\)

35. \((-5, -4) \quad (10, -8)\)

36. \((0, 4) \quad (0, 3)\)
Binomial Expansion:
\[(a + b)^2 = (a + b)(a + b) = a^2 + 2ab + b^2\]

Expand the following expressions.
37. \((8 + x)^2\)
38. \((2x - 4)^2\)

Rational Expressions:

If \(f(x) = \frac{q(x)}{r(x)}\), then \(f(x) = \frac{p(x)}{q(x)} \cdot \frac{s(x)}{r(x)}\),

where \(q(x) \neq 0\), \(s(x) \neq 0\), \(r(x) \neq 0\)

Simplify the following rational functions. State any restrictions.
39. \(\frac{x^2 - x - 6}{x^2 - 4x + 3}\)
40. \(\frac{2x^2 - 6x}{x^2 + 18x + 81} \cdot \frac{9x + 81}{x^2 - 9}\)
41. \(\frac{6x + 6y}{x - y} \cdot \frac{18}{5x - 5y}\)
42. \(\frac{3}{x + 1} + \frac{x}{x - 1}\)
43. \(\frac{1}{x} - \frac{-1}{x - 1}\)
Graphing:
Changes to the “outside” of $f(x)$ affect a graph vertically.
Changes to the “inside” of $f(x)$ affect a graph horizontally.

Domain is the set of possible $x$-values.
Range is the set of possible $y$-values.

Graph the following functions. State the domain and range of each.

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

45. $f(x) = -x^2 + 4$

46. $f(x) = \sqrt{2x}$

PurpleMath Topics:
Intermediate Algebra Topics:
- Domain and Range
- Graphing Quadratic Equations
47. Solve the system using substitution:
\[
\begin{align*}
4x + y &= 9 \\
3x - 2y &= 4
\end{align*}
\]

48. Solve the system using elimination:
\[
\begin{align*}
2m - n &= -1 \\
3m + 2n &= 30
\end{align*}
\]

50. (3a)^2 = 3a^4

51. -2^4 = 16

52. 3x + 4y = 7xy

53. (-2x)^2 = -4x^2

54. 2x^3 - 6x^2 + 2x = 2x(x^2 - 3x)

55. (x^2 + 25) = (x - 5)(x + 5)

56. (x + 2)^2 = x^2 + 4
57. $\sqrt{432} = 12\sqrt{3}$

62. $\frac{x^2 - 1}{x + 1} = x - 1$

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

58. $\sqrt{-x} \cdot \sqrt{-y} = \sqrt{xy}$

64. $\frac{a + b}{x} \neq a + \frac{b}{x}$

59. $\sqrt{x^2 + 4} = x + 2$

65. $\frac{a}{x + b} \neq a + \frac{a}{b}$

60. $\frac{-4 \pm \sqrt{10}}{2} = -2 \pm \sqrt{5}$

66. $\frac{5x + 10}{20} = x + 2$  

67. $\frac{2x - 1}{1 - 2x} = -1$

61. $3x^{-1} = \frac{1}{3x}$
69. \( a \left( \frac{x}{y} \right)^2 \cdot \frac{ax}{ay} \)

70. \( \frac{x^3 - 2x^2 + 4x - 8}{x^2 + x - 6} \cdot \frac{x^2 (x - 2) + 2}{x + 3} \)

71. \( \frac{x^3 - x^2 + x - 1}{x^4 - x^3 + 2x - 2} \cdot \frac{x^2 + 1}{x^3 + 2} \)

72. \( \frac{x}{y} \cdot \frac{w + a}{z + b} \cdot \frac{x (\frac{z + b}{w + a})}{y} \)