AP Calculus Summer Work
12th grade

Lines:

- Slope
- Parallel and Perpendicular Lines
- Vertical and Horizontal Lines
- Equations of Lines:
  - Point-slope equation
  - Slope-Intercept equation
  - General Linear Equation
- Graphing Linear equations

Functions and Graphs:

- What is a function?
- Domain and Range
- Even and Odd Functions – Symmetry
- Piecewise functions
- Absolute Value function
- Composite Functions
- Exponential functions
- Finding zeroes graphically
- Exponential growth and decay
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- One-to-one function
- Horizontal line test
- Inverse functions
- Logarithmic functions
  - Properties of logarithms
  - Change of base formula
  - Natural logarithms
- Trigonometric functions
  - Radian measure
  - Periodicity
  - Even and odd functions
  - Graphing trigonometric functions
  - Inverse trigonometric functions
  - Restricting domains of trigonometric functions

If you need to review, I suggest either going to youtube.com or to Khan Academy for a review lesson. We will briefly discuss these topics the first and second day of class, but since these topics were covered (or should have been covered) in Algebra II or Algebra III, I do not intend for us to spend much time on these concepts. You may need a graphing calculator for some of these problems. If you do not have one at home, you can download one onto your phone, such as, desmos, of geogebra.

Lines:

Write an equation for the specified line:

1. Through (1, -6) with slope 3
2. The vertical line through (0, -3)
3. Through (-3, 6) and (1, -2)
4. The horizontal line through (0, 2)
5. Through (3, 1) and parallel to $2x - y = -2$
6. With slope -3 and y-intercept 3
7. Through (-2, -3) and perpendicular to $\frac{1}{2}x + \frac{1}{3}y = 1$
8. Through (4, -2) with y-intercept -5

Functions:

Determine whether the function is odd, even, or neither. Explain why.

9. $y = x^2 + 1$
10. $y = 1 - \cos x$
11. $y = x^5 - x^3 - x$
12. $y = \dfrac{x^4 + 1}{x^3 - 2x}$
13. $y = \sqrt{(x^4 - 1)}$ (Note: $\sqrt{}$ means square root)

Find the domain and range of each function, then graph each function.

14. $y = |x| - 2$
15. $y = \sqrt{(16 - x^2)}$
16. $y = 3^{2-x} + 1$
17. $y = 2\sin(3x + \pi) - 1$
18. $y = x^{2/5}$
19. $y = \begin{cases} -x - 2, & -2 \le x \le -1 \\ x, & -1 < x \le 1 \\ -x + 2, & 1 < x \le 2 \end{cases}$
20. $y = \ln(x - 3) + 1$

Find (a)$(f \circ g)(-1)$, (b) $(g \circ f)(2)$, (c) $(f \circ f)(x)$, and (d) $(g \circ g)(x)$ for 20-21.

21. $f(x) = 1/x, \quad g(x) = 1/\sqrt{(x + 2)}$
22. $F(x) = 2 - x, \quad g(x) = (x + 1)^{1/3}$

Find the inverse of each function.

23. $f(x) = 2 - 3x$
24. $f(x) = (x + 2)^2$

Find the measures of the angles in radians and degrees:

25. $\sin^{-1}(0.6)$
26. $\tan^{-1}(-2.3)$

Solve the following problems for $f(x) = 1 - 3\cos(2x)$.

a. What is the domain of f?
b. What is the range of f?
c. What is the period of f?
d. Is f an even function, odd function, or neither?
e. Find all the zeros of f in $\pi/2 \leq x \leq \pi$.