CA12 Functions and Graphs Lesson

- Parent functions from Pre-Calculus 12 (ex. exponential, logarithmic, polynomial, rational, trigonometric)
- Piecewise functions
- Inverse trigonometric functions

1. Calculus is the study of continuous c_____, and was developed independently in the late 17th century by N_____ and L_____.

2. Another word for instantaneous slope is rate of c_____.

3. Why do so many fields of study require the study of Calculus?

4. Where does Calculus fit on the "map of mathematics"?

5. Sketch $y = 3^{-x} - 2$

6. Sketch $y = e^{x} + 2$

7. Sketch $y = \left(\frac{1}{2}\right)^{x} + 2$

8. Sketch $y = \log_2(x - 1)$

9. Sketch $y = \frac{-\ln x^3}{2}$

10. Sketch $y = x^3 - 3x^2 + 4$

11. Sketch $y = \frac{3x-2}{x+1}$

12. Sketch $y = \frac{2x^2-4x}{x^3-x^2-2x}$

13. Sketch $y = -2\cos 2x + 2$

14. Sketch $y = \tan\left(\frac{2\pi x}{3}\right)$

15. Sketch $f(x) = \begin{cases} x^2 - 2x + 1 & x < 4 \\ 6 & x = 4 \\ \frac{x}{2} + 7 & x > 4 \end{cases}$

16. Sketch $f(x) = \begin{cases} 6 & x \leq 0 \\ 6 - 2x & 0 < x < 3 \\ \sqrt{x-2} - 1 & x > 3 \end{cases}$

17. Sketch $y = \arcsin x$

18. Sketch $y = \cos^{-1} x$

19. Sketch $f(\theta) = \arctan \theta$

20. $g(x) = \begin{cases} -(x-2)^2 + 4 & x < 3 \\ y = 2x + k & x \geq 3 \end{cases}$

Find the value of k so that $g(x)$ is continuous (defined $x \in \mathbb{R}$)

21. Sketch $y = \sqrt{9 - x^2}$

22. Sketch $y = \frac{x-1}{|x-1|}$

23. Sketch $y = \csc x$

24. Sketch $y = \frac{1}{x^2-9}$

25. Sketch $y = x^{\frac{2}{3}}$.

26. Even function, odd function, or neither?

a. $f(x) = x^4 - 2x^2$

b. $f(x) = 2x + 3$

c. $f(x) = x^3 + x$

d. $f(x) = \tan x + x$

e. $y = \cos^2(2x)$

f. $y = e^x + \ln x$

g. $y = \frac{1}{x}$

h. $x = y$

Enrichment

27. Inverse functions:

a. $f(x) = 2^{x-1}$. Find $f^{-1}(x-1)$

b. $f(x) = (x-2)^2 - 4, x \geq 2$. Find $g(x) = 2f^{-1}(x)$

c. $f(x) = x^2 + 4x - 1$. Find $f^{-1}(x)$

28. Sketch $(x-2)^2 + (y-3)^2 = 25$

29. Sketch $4x^2 + 9y^2 = 36$

30. Sketch $y = |2x - 6| + 1$

31. Sketch $y = 4 - \frac{1}{(x-2)^2}$

32. Sketch $y = \log_2 x^2$

33. Sketch $y = |\sin x|$

34. $f(x) = 1 - \cos^2 x$

    a. Sketch
    $y = \sin^2 x$

    b. Find $g(x) = f(x) = a \cos(2x) + b$

35. Sketch $y = \operatorname{arccsc} x$

36. Sketch $f(x) = \sec^{-1} x$

37. $f(x) = \tan x$
    a. Describe $\cot x$ as a transformation of $\tan x$

    b. Sketch $\cot^{-1} x$

38. Sketch the piecewise function below using Desmos piecewise notation then transform the graph by flipping it about the x-axis.