Written Assignment Unit 1

Godfrey Ouma

University of the People

MATH 1211: Calculus

Rakesh Das

November 22, 2023

Written Assignment Unit 1

1. **What linear function, $y = f(x)$ has $f(0) = 8$ and $f(7) = 14$?**

   For $f(0) = 8$ and $f(7) = 8$, it implies that the linear function is passing through the points (0,8) and (7,14) respectively. The slope of the linear function can be determined as follows: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{14-8}{7-0} = \frac{6}{7}$.

   Using the point-slope form, $y - y_1 = m(x - x_1)$.

$$y - 14 = \frac{6}{7}(x - 7)$$

   Therefore, the linear function becomes $y = \frac{6}{7}x + 8$.

2. **If $f(t) = 2t - t^2 + 3$, what is $\frac{f(t+h)-f(t)}{h}$?**

$$\frac{f(t+h) - f(t)}{h} = \frac{2(t+h) - (t+h)^2 + 3 - (2t - t^2 + 3)}{h}$$

$$= \frac{(-t^2 + 2t - 2th - h^2 + 2h + 3) - (2t - t^2 + 3)}{h}$$

$$= \frac{-2th - h^2 + 2h}{h}$$

$$= \frac{h(-2t - h + 2)}{h}$$

$$= -2t - h + 2$$

3. **Find all solutions to the equation $-4cosx = -sin^2x + 1$. Write your answer in radians in terms of π.**

$-4cosx = -sin^2x + 1$

$sin^2x = 1 - cos^2x$

$-4cosx = -1 + cos^2x + 1$

$0 = cos^2x + 4cosx$

$0 = cosx(cosx + 4)$

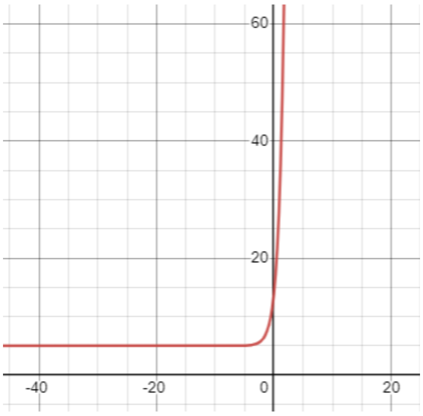
$cosx = 0$ or $cosx + 4 = 0$

For $cosx = 0, the\ solutions\ are\ x = \frac{\pi}{2} + n\pi$ and $x = \frac{3\pi}{2} + n\pi$, where n is an integer.

For $cosx + 4 = 0$, solving for $cosx$ gives $cosx = -4$, which has no real solutions

because the cosine function has a range of (1,1).

4. **Sketch the graph of $y = 3^{x+2} + 5$. Find the domain, range, and horizontal asymptote. Include the horizontal asymptote in your graph.**

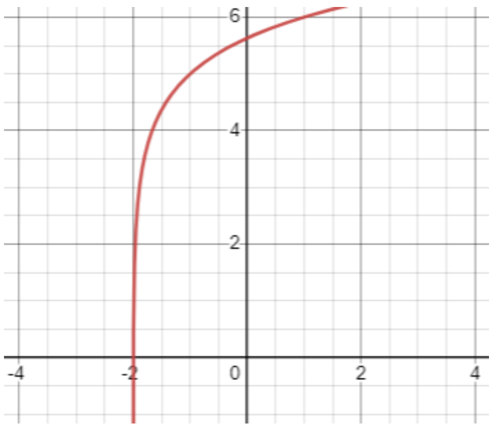


Domain: $(-\infty < x < \infty)$.

Range: $(5, \infty)$.

Horizontal asymptote: $y = 5$.

5. **Sketch $log_3(x + 2) + 5$. Find the domain, range, and vertical asymptote. Include the vertical asymptote in your graph.**



Vertical asymptote: $x = -2$

Domain: $(-2, \infty)$

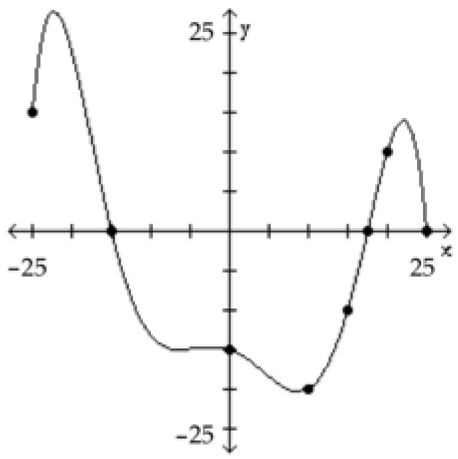
Range: $(-\infty, \infty)$

Vertical asymptote: $x = -2$

6. **Find the domain of the function $g(x) = \frac{2x}{x^2-81}$.**

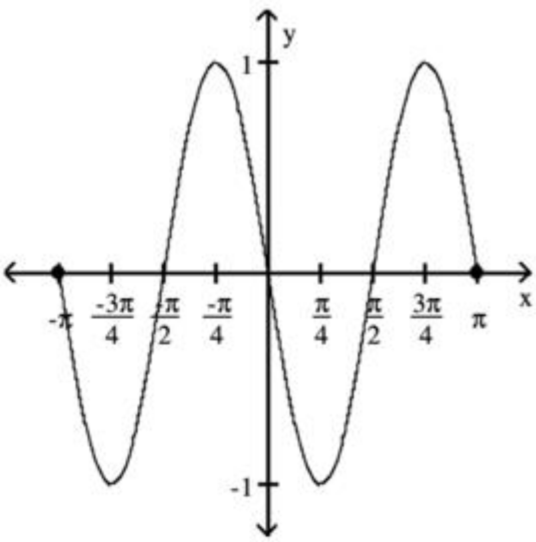
Solving the denominator: $x^2 - 81$, $x = \pm 9$. This means that g(x) will become undefined at $x = 9$ and $x = -9$. Therefore, domain becomes $(-\infty, -9)U(-9,9)U(9, +\infty)$.

7. **From the graph below, find what is $f(-15)$ and for what numbers x is $f(x) = 0$.**



From the graph, $f(-15) = 0$, and the values of x when $f(x) = 0$ is -15 and 17.5.

8. **Determine whether the graph is that of a function. If it is, use the graph to find its domain, and range, the intercepts, if any, and any asymptote with respect to the x-axis, the y-axis, or the origin.**



The graph is a function since the vertical line cuts it once.

Domain: $(-\pi, \pi)$

Range: $(1, -1)$

Horizontal asymptote: $y = 1$ and $y = -1$

9. Determine whether the function is even, odd, or neither.

a) $\boldsymbol{f(x) = 4x^3}$

This is an odd function

b) $\boldsymbol{f(x) = \frac{-x^3}{4x^2+3}}$

This is an even function

c) $\boldsymbol{f(x) = 3x^3 - 5}$

This is neither an even function nor an odd function.

10. A cellular phone plan had the following schedule of charges: Basic service, including 100 minutes of calls is $20.00/per month; 2nd 100 minutes of calls is $0.075/minute; additional minutes of calls is $0.10/minute.

a) What is the charge for 200 minutes of calls in one month?

100 minutes are covered by the basic service ($20.00).

The next 100 minutes are charged at $0.075 per minute.

Total charge for 200 minutes: $20.00 + (0.075 * 100) = \$27.50$

b) What is the charge for 250 minutes of calls in one month?

100 minutes are covered by the basic service ($20.00).

The next 100 minutes are charged at $0.075 per minute.

The remaining 50 minutes are charged at $0.10 per minute.

Total charge for 250 minutes: $20.00 + (0.075 * 100) + (0.10 * 50) =$ \$32.50

c) **Construct a function that relates the monthly charge C for x minutes of calls?**

For $x \leq 100$ minutes: $C = 20.00$

For $100 < x \leq 200$ minutes: $C = (20.00 + 0{,}075) * (x - 100)$

For $x > 200$ minutes: $C = 20.00 + (0.075 * 100) + 0.10(x - 200)$