Problem bank for "Week 3" material (For discussion 9/15): Exp functions, Log functions, Trig functions and Limits

15 Sep 2020

Group 1

Solve the equation
$$\log(x + 5) + \log(x + 2) = 1$$

Group 2

Find the period of the functions

1. $f(x) = \cos(4x)$

2. $f(x) = \sin(\frac{x}{2})$

3. $f(x) = 2\sin(2(x + \frac{\pi}{4}))$

Group 3

Find the limit:
$$\lim_{x \to 4} \frac{\sqrt{x} - 2}{x - 4}$$

Group 4

Evaluate the limit
$$\lim_{x \to 1} \frac{x^3 - 1}{x^2 - 1}$$

Group 5

The allometric formula is used to describe a wide variety of growth patterns. It says that $y = nx^m$, where x and y are variables, and n and m are constants. For example, the famous biologist J. S. Huxley used this formula to relate the weight of the large claw of the fiddler crab to the weight of the body without the claw. Show that if x and y are given by the allometric formula, then $X = \log_b x$, $Y = \log_b y$, and $N = \log_b n$ are related by the linear equation

$$Y = mX + N$$

Extra Probmes

1. The cost (in dollars) for manufacturing a particular toy is

   $$C(x) = 25000 + 9x$$

   where x is the number of toys produced. Recall from the previous chapter that the average cost per toy, denoted by $\bar{C}(x)$, is found by dividing $C(x)$ by x. Find and interpret

   $$\lim_{x \to \infty} \bar{C}(x)$$

2. Find the limit:
   $$\lim_{x \to \infty} \frac{3x^3 - 2x + 1}{2x^3 + 5x^2 + 7}$$

3. If $\lim_{x \to 1} f(x) = 2$ and $\lim_{x \to 1} g(x) = 4$, evaluate

   $$\lim_{x \to 1} f(x)^2 + \log_2 g(x)$$

4. Graph the function
   $$y = -\frac{1}{2}\cos x$$

5. Graph the function
   $$y = 2\cos(x + \pi)$$