

This file contains questions spanning CLP-1. It should not be taken as a complete review of the course, but rather as a jumping-off point. If you struggle with one question, go back to review its entire section. Sections are noted at the bottom of each page.

S1Find all solutions to $x^3 - 3x^2 - x + 3 = 0$

S2

Compute the limit $\lim_{x \rightarrow 2} \frac{x - 2}{x^2 - 4}$

S3

Find all values of c such that the following function is continuous:

$$f(x) = \begin{cases} 8 - cx & \text{if } x \leq c \\ x^2 & \text{if } x > c \end{cases}$$

Use the definition of continuity to justify your answer.

S4

Compute

$$\lim_{x \rightarrow -\infty} \frac{3x + 5}{\sqrt{x^2 + 5} - x}$$

S5

Find the equation of the tangent line to the graph of $y = \cos(x)$ at $x = \frac{\pi}{4}$.

S6

For what values of x does the derivative of $\frac{\sin(x)}{x^2 + 6x + 5}$ exist?

S7

Find $f'(x)$ if $f(x) = (x^2 + 1)^{\sin(x)}$.

S8

Consider a function of the form $f(x) = Ae^{kx}$ where A and k are constants. If $f(0) = 3$ and $f(2) = 5$, find the constants A and k .

S9

Consider a function $f(x)$ which has $f'''(x) = \frac{x^3}{10 - x^2}$. Show that when we approximate $f(1)$ using its second Maclaurin polynomial, the absolute error is less than $\frac{1}{50} = 0.02$.

S10

Estimate $\sqrt{35}$ using a linear approximation

S11

Let $f(x) = x^2 - 2\pi x - \sin(x)$. Show that there exists a real number c such that $f'(c) = 0$.

S12

Find the intervals where $f(x) = \frac{\sqrt{x}}{x+6}$ is increasing.

L1

Compute the limit $\lim_{x \rightarrow 1} \frac{\sqrt{x+2} - \sqrt{4-x}}{x-1}$.

L2

Show that there exists at least one real number c such that $2 \tan(c) = c + 1$.

L3

Determine whether the derivative of following function exists at $x = 0$

$$f(x) = \begin{cases} 2x^3 - x^2 & \text{if } x \leq 0 \\ x^2 \sin\left(\frac{1}{x}\right) & \text{if } x > 0 \end{cases}$$

You must justify your answer using the definition of a derivative.

L4

If $x^2 \cos(y) + 2xe^y = 8$, then find y' at the points where $y = 0$.
You must justify your answer.

L5

Two particles move in the cartesian plane. Particle A travels on the x -axis starting at $(10, 0)$ and moving towards the origin with a speed of 2 units per second. Particle B travels on the y -axis starting at $(0, 12)$ and moving towards the origin with a speed of 3 units per second. What is the rate of change of the distance between the two particles when particle A reaches the point $(4, 0)$?

L6

Find the global maximum and the global minimum for
 $f(x) = x^3 - 6x^2 + 2$ on the interval $[3, 5]$.
