
Please provide complete and well-written solutions to the following exercises.

No due date, but the quiz in Week 3 in the discussion section (on October 13th or 15th) will be based upon this homework.

Assignment 3

Exercise 1. Compute

$$\lim_{y \rightarrow \infty} \frac{4y^5 + 5}{(y^2 - 2)(2y^2 - 1)}.$$

Exercise 2. Find all horizontal and vertical asymptotes of the following functions:

- $y = 1/x$.
- $y = \frac{\cos^2 x}{x^2}$.
- $y = \sqrt{x^2 + x + 1} - \sqrt{x^2 + x}$.

(A vertical asymptote occurs at a when any one-sided limit of y at a is ∞ or $-\infty$. A horizontal asymptote occurs if $\lim_{x \rightarrow \infty} y(x)$ exists, or if $\lim_{x \rightarrow -\infty} y(x)$ exists.)

Exercise 3. Show that the function $f(x) = x^3 - x - 1$ has a zero between -1 and 2 .

Exercise 4. Let $g(x) = x^{2/3}$.

- Show that $g'(0)$ does not exist.
- If $a \neq 0$, find $g'(a)$, using the definition of the derivative.
- Show that $y = x^{2/3}$ has a vertical tangent line at $x = 0$.
- Demonstrate the vertical tangent line by graphing $y = x^{2/3}$.

Exercise 5. Suppose a baseball is thrown vertically upward with a velocity of 80 ft/s. Then its height after t seconds is $r(t) = 80t - 16t^2$.

- What is the maximum height reached by the baseball?
- What is the velocity of the ball when it is 96 feet above the ground on the way up?
And on the way down?

Exercise 6. Suppose the curve $y = x^4 + ax^3 + bx^2 + cx + d$ has a tangent line when $x = 0$ with the equation $y = 2x + 1$ and a tangent line when $x = 1$ with equation $y = 2 - 3x$. Find the values of a, b, c and d .