

Calculus 1 Review Problems

1. Let $f(x)$ be the mappings of VCU students to the classes they are taking this semester. Is this a function? If so, what is the domain and range?

1. Written Solution
2. No Video Solution

2. Determine the domain of

$$\frac{\sqrt{x+4}}{x-2}$$

1. Written Solution
2. Video Solution

3. Let

$$f(x) = \begin{cases} \frac{1}{x-2} & \text{if } x \leq 0 \\ x^2 - \frac{1}{2} & \text{if } 0 < x < 1 \\ x + 1 & \text{if } 1 \leq x \end{cases}$$

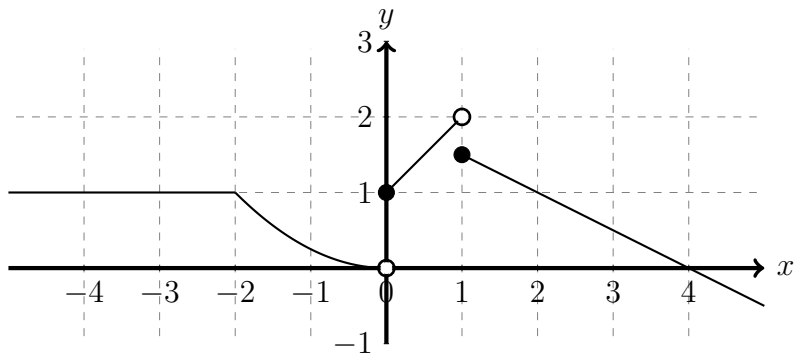
Then find

$$\lim_{x \rightarrow 1^+} f(x) = \quad \lim_{x \rightarrow 1^-} f(x) = \quad \lim_{x \rightarrow 1} f(x) = \quad f(1) =$$

$$\lim_{x \rightarrow 0^+} f(x) = \quad \lim_{x \rightarrow 0^-} f(x) = \quad \lim_{x \rightarrow 0} f(x) = \quad f(0) =$$

1. Written Solution
2. Video Solution

4. Let $f(x)$ be given by the following graph



Then find

$$\lim_{x \rightarrow 1^+} f(x) = \quad \lim_{x \rightarrow 1^-} f(x) = \quad \lim_{x \rightarrow 1} f(x) =$$

$$\lim_{x \rightarrow 0^+} f(x) = \quad \lim_{x \rightarrow 0^-} f(x) = \quad \lim_{x \rightarrow 0} f(x) =$$

1. Written Solution
 2. Video Solution
5. Find

$$\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$$

6. Find

$$\lim_{x \rightarrow 0} \frac{\frac{1}{2+x} - \frac{1}{2}}{x}$$

7. Find

$$\lim_{x \rightarrow 0} \frac{\sqrt{9+x} - 3}{x}$$

1. Written Solution
2. Video Solution

8. Find the horizontal and vertical asymptotes of

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

1. Written Solution
2. Video Solution

9. Use the limit definition of derivative to find $f'(x)$ if $f(x) = \sqrt{x}$.

1. Written Solution
2. Video Solution

10. Find

$$\frac{d}{dx} \left(\frac{x^2 - 2}{x} + 3e^x \right)$$

1. Written Solution
2. Video Solution

11. Find the derivative of

$$f(x) = (x^3 + 2) \ln(x)$$

1. Written Solution
2. Video Solution

12. Find

$$\frac{d}{dx} \frac{(x^2 + 2x)(\sin(x) + 5)}{3x + 2}$$

1. Written Solution
2. Video Solution

13. Find the derivative of $f(x) = \tan^{-1}(x^4 + 2x)$.

1. Written Solution

2. Video Solution

14. Find $y' = \frac{dy}{dx}$ if

$$y^3 + x^3 = xe^y$$

1. Written Solution

2. Video Solution

15. Suppose that you are standing on the shore of a calm lake on a beautiful spring day. You cast a fishing lure out into the lake and it causes a ripple. You begin to reel the line it trying to entice a fish into biting the lure. Suddenly, you feel a tug on your line as a fish hits the lure. You set the hook and begin reeling in. As you reel in, the fish decides to run and starts swimming directly toward you at a rate of 15 feet per second. In order to keep the fish on the line, you need to keep tension on the line. Therefore, you have to reel in order to keep the line taught. Currently there is 100 feet of line let out past your pole and the tip of the pole is 10 foot above the fishes height. At what rate do you have to reel line in so that you keep the line taught?

1. Written Solution

2. Video Solution

16. Suppose that you are standing on the shore of a calm lake on a beautiful spring day. Without the wind blowing, you look out onto the lake as it sits completely still. You cast a fishing line out into the lake as you try to enjoy a day of fishing. As your lure hits the water, it causes a ripple to expand from the point of impact, creating a circle. If the radius of the ripple is increasing by 3 inches per second, how fast is the area of the ripple growing when the radius is 24 inches?

1. Written Solution

2. Video Solution

17. Let $f(x) = x(x - 2)^3$.

1. Determine the intervals of increasing and decreasing, critical points and local extrema of the function .

(a) Written Solution

(b) Video Solution

2. Determine the intervals of concavity and inflection points.

(a) Written Solution

(b) Video Solution

3. Provide a graph of the function.

(a) Written Solution

(b) Video Solution

18. Find the absolute maximum and minimum of the function $f(x) = \frac{x^3}{3} - x + 2$ on the interval $[0, 3]$

1. Written Solution

2. Video Solution

19. Determine

1. $\lim_{x \rightarrow 1} \frac{\ln(x)}{x-1}$

2. $\lim_{x \rightarrow 0} \frac{\cos(x)-1}{x^2}$

3. $\lim_{x \rightarrow \infty} x \ln\left(1 + \frac{2}{x}\right)$

4. $\lim_{x \rightarrow 0} x^x$

1. Written Solution

2. Video Solution

20. I recently decided that I wanted to start a garden in my back yard. While I don't have a huge back yard, I should have enough room to make a small garden and grow a few plants. When I looked in my shed I found 24 feet of usable fencing that I can use to enclose my garden. Furthermore, I already have a fence around my back yard, so I will use that fence for one of the sides of the rectangular garden I plan to make. Before digging up the grass and tilling the soil, I want to know what dimensions I should make the garden to ensure that I have the largest area available for planting.

1. Written Solution

2. Video Solution

21. Sketch the function $f(x) = \frac{x^2-9}{x^2-2x-3}$. Label all pertinent information. Note that

$$f'(x) = \frac{-2(x-3)}{(x+1)^2(x-3)}$$

$$f''(x) = \frac{4(x-3)}{(x+1)^3(x-3)}$$

1. Written Solution

2. Video Solution

22. Find R_4 for $f(x) = 2x^2 + 3$ on the interval $[0, 4]$.

1. Written Solution

2. Video Solution

23. Find

$$\int 2x^3 - \frac{3}{x^2} - \frac{1}{x} + \sin(x) dx$$

1. Written Solution

2. Video Solution

24. Find

$$\int_0^1 x^3(x^4 + 2)^3 dx$$

1. Written Solution

2. Video Solution

25. Find the area below the function $f(x) = \sin(x) + 2$ and the x -axis on the interval $[0, \pi]$.

1. Note that the area under $f(x)$ and above the x -axis is defined to be the definite integral of the function on the given interval. That is, you need to find $\int_0^{\pi} (\sin(x) + 2) dx$.