

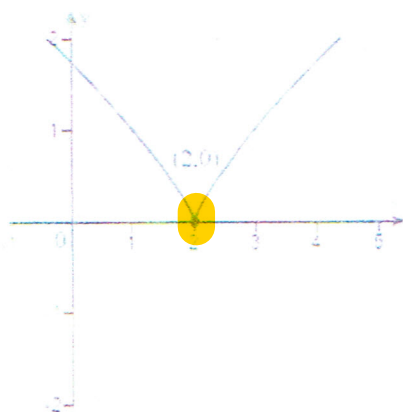
APRIL 2, 2020

Test #4 A

Show Your Work (8 points each unless noted otherwise)

1. Find any critical numbers of the function $g(t) = t\sqrt{2-t}$, $t < 2$.

2. Find the value of the derivative (if it exists) of $f(x) = (x-2)^{4/5}$ at the indicated extremum.



3. Determine whether the Mean Value Theorem can be applied to the function $f(x) = x^5$ on the closed interval $[0, 16]$. If the Mean Value Theorem can be applied, find all numbers c in the open interval $(0, 16)$ such that

$$f'(c) = \frac{f(16) - f(0)}{16 - 0}.$$

4. Find the points of inflection and discuss the concavity of the function.

$$f(x) = 4x^3 - 5x^2 + 5x - 7$$

5. Locate the absolute extrema of the function $g(t) = \frac{t^2}{t^2 + 2}$ on the closed interval $[-3, 3]$.

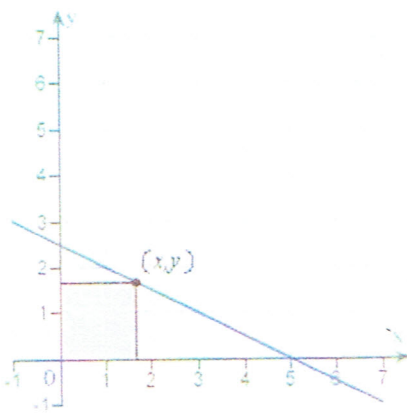
6. Identify the open intervals on which the function $y = 9x - 18\cos x$, $0 < x < 2\pi$ is increasing or decreasing.

7. Find all relative extrema of the function $f(x) = -4x^2 - 32x - 62$. Use the Second Derivative Test where applicable.

8. For the function $f(x) = (x - 1)^{\frac{2}{3}}$:

- (a) Find the critical numbers of f (if any);
- (b) Find the open intervals where the function is increasing or decreasing; and
- (c) Apply the First Derivative Test to identify all relative extrema.

9. Find the relative extremum of $f(x) = -9x^2 + 54x + 2$ by applying the First Derivative Test.
10. Determine the open intervals on which the graph of the function $y = 3x - \tan x$, $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ is concave upward or concave downward.
11. **(10 points)** A rectangle is bounded by the x - and y -axes and the graph of $y = \frac{(5-x)}{2}$ (see figure). What length and width should the rectangle have so that its area is a maximum?



12. (10 points) For the graph of the function $f(x) = \frac{x^2}{x^2 - 1}$, find:

1. any x intercepts

2. any y intercepts

3. any symmetry

4. the domain

5. the range

6. any vertical asymptotes

7. any horizontal asymptotes

8. any relative extrema

9. any concavity

10. any points of inflection.