

Calculus

Chapter 4: Applications of Derivatives

Lesson 1: Analyzing Functions Part I: Curve Sketching

Question #1

Reference Q.495

Sketch a graph with the following properties and find an example of a function that fulfills those same properties:

$f(x)$ is concave down and decreasing everywhere.

Question #2

Reference Q.496

Sketch a graph with the following properties and find an example of a function that fulfills those same properties:

$f(x)$ is concave down and increasing everywhere.

Question #3

Reference Q.497

Sketch a graph with the following properties and find an example of a function that fulfills those same properties:

$f(x)$ is concave up and increasing everywhere.

Question #4

Reference Q.498

Sketch a graph with the following properties and find an example of a function that fulfills those same properties:

$f(x)$ is concave up and decreasing everywhere.

Question #5

Reference Q.499

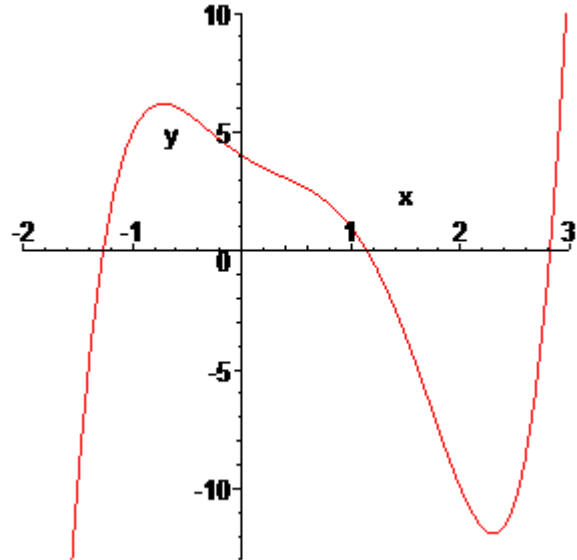
Sketch a graph with the following properties and find an example of a function that fulfills those same properties:

$f(x)$ is increasing everywhere, has an inflection point at $(1,0)$ and is concave down to the left of that point.

Question #6

Reference Q.500

From the graph of $f(x)$ below, find where the function a) is increasing b) and decreasing, c) is concave up d) or down, and e) has any inflection points.



Question #7

Reference Q.501

Find the critical points of:

$$f(x) = 5x^4 - 10x^2 + 8$$

Question #8

Reference Q.502

Find the critical points and key values of:

$$f(x) = \frac{4x - 3}{3\sqrt{x}}$$

Question #9

Reference Q.503

Find the critical points of:

$$f(x) = \sqrt[3]{\cos x}$$

Question #10

Reference Q.504

AP Prep:

Find the critical points of:

$$f(x) = |\cos x|$$

Question #11

Reference Q.505

For the function below, determine the intervals of a) increase and b) decrease as well as the c) intervals of concavity:

$$f(x) = 2x^2 - 3x + 2$$

- a. increase
- b. decrease
- c. concavity

Question #12

Reference Q.506

For the function below, determine the intervals of a) increase and b) decrease as well as the c) intervals of concavity:

$$f(x) = x^3 \left(x - \frac{8}{3} \right)$$

- a. increase
- b. decrease
- c. concavity

Question #13

Reference Q.507

For the function below, determine the intervals of a) increase and b) decrease as well as the c) intervals of concavity:

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

- a. increase
- b. decrease
- c. concavity

Question #14

Reference Q.508

For the function below, determine the intervals of a) increase and b) decrease as well as the c) intervals of concavity:

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

- a. increase
- b. decrease
- c. concavity

Question #15

Reference Q.509

For the function below, determine the intervals of a) increase and b) decrease as well as the c) intervals of concavity:

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

- a. increase
- b. decrease
- c. concavity

Question #16

Reference Q.510

For the function below, determine the intervals of a) increase and b) decrease as well as the c) intervals of concavity:

$$f(x) = x \ln x$$

- a. increase
- b. decrease
- c. concavity

Question #17

Reference Q.511

For the function below, determine the intervals of a) increase and b) decrease as well as the c) intervals of concavity:

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

- a. increase
- b. decrease
- c. concavity

Question #18

Reference Q.512

For the function below, determine the intervals of a) increase and b) decrease as well as the c) intervals of concavity:

$$f(x) = \cos x - \sin x$$

- increase
- decrease
- concavity

Question #19

Reference Q.513

Sketch a continuous function that:

Goes through the point (1,5) and is concave up everywhere.

Question #20

Reference Q.514

Sketch a continuous function that:

Goes through the point (1,5), has a horizontal slope at $x = 1$, has an inflection point at $x = 1$, and is concave down when $x < 1$.

Question #21

Reference Q.515

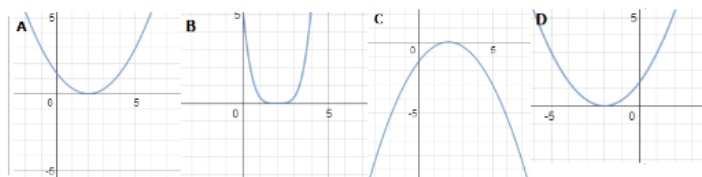
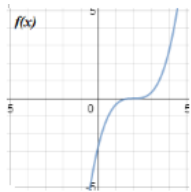
Use your graphing calculator and/or algebraic analysis of derivatives to:

- sketch a graph of the following rational function: $y = \frac{2x}{x^2 - 9}$
- find all the critical points (including key values) and inflection points

Question #26

Reference Q.9193

Which of the following could be $f'(x)$?



Question #22

Reference Q.516

Sketch a graph of the following function, indicating critical points and inflection points. Check your answer with your graphing calculator.

$$y = 3x + 2x^{\frac{2}{3}}$$

Question #23

Reference Q.517

Sketch a graph of the following function, indicating critical points (and key values), and inflection points. Check your answer with your graphing calculator.

$$y = \ln(x^2 - 1)$$

Question #24

Reference Q.518

Sketch a graph of the following function, indicating critical points, possible inflection points and end behavior. Check your answer with your graphing calculator.

$$f(x) = x^2 e^{-x}$$

Question #25

Reference Q.519

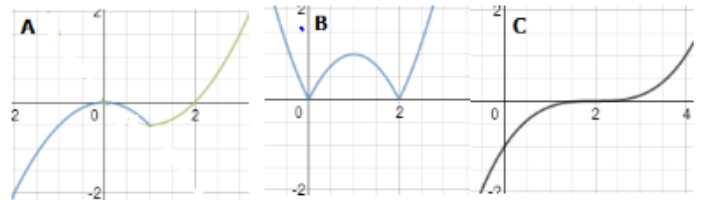
Sketch a graph of the following function, indicating critical points and inflection points. Check your answer with your graphing calculator.

$$f(x) = \cos(5x) + 5x$$

Question #27

Reference Q.9194

Suppose $f'(x) = |x - 1| - 1$. Which of the following could be $f(x)$, if any?



🔍 **Question #28**

Reference Q.9195

$f(x) = 2^{\cos 2x}$. How many possible points of inflection does $f(x)$ happen between 0 and π .