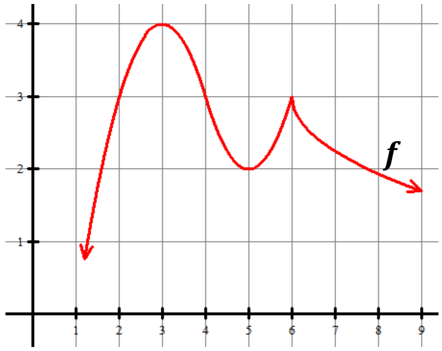
5.2 First Derivative Test

NOTES

CALCULUS

Write your questions here!



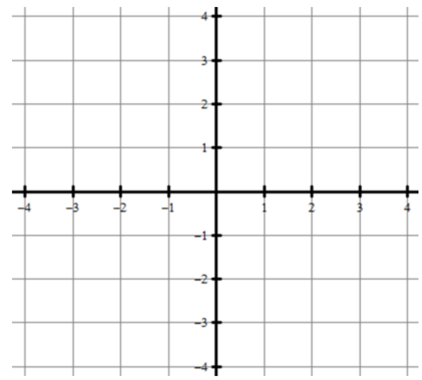
CRITICAL POINTS

SIGN CHART

Interval	$(-\infty, 3)$	$(3, 5)$	$(5, 6)$	$(6, \infty)$
$f'(x)$				

Curve Sketching

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



Interval			
Test Value			
$f'(x)$			
Conclusion			

A particle moves along the *x*-axis with the position function given below. Describe its motion.

$$x(t) = \frac{8t}{t^2+1}$$

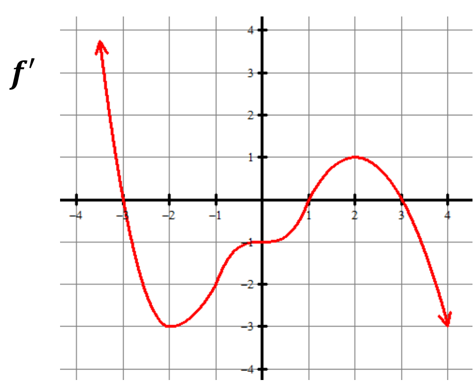
Use the First Derivative Test to find the relative extrema.

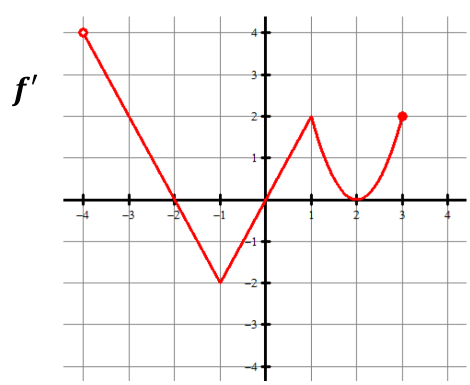
$$f(x) = (x^2 - 4)^{\frac{2}{3}}$$

Find the interval(s) where the function is increasing and decreasing.

$f(x) = \frac{1}{2}x - \sin x$ on the interval $[0, 2\pi]$

Given the graph of f', find all critical points and locate all relative extrema.





SUMMARY:

Now, summarize your notes here!

5.2 First Derivative Test

PRACTICE

Complete the sign chart and locate all extrema.

1. Given $f(x)$ is continuous and differentiable.

Interval	$(-\infty, -2)$	$(-2, 0)$	$(0, 3)$	$(3, \infty)$
Test Value	$x = -4$	$x = -1$	$x = 1$	$x = 4$
$f'(x)$	$f(-4) = 4$	$f(-1) = -3$	$f(1) = -7$	$f(4) = \frac{1}{2}$
Conclusion				

Use the First Derivative Test to locate the extrema. ALWAYS JUSTIFY!

2. $f(x) = x^3 - 12x + 1$

3. $g(x) = x^2(x - 3)$

Determine where the function is increasing and decreasing. Find all extrema. ALWAYS JUSTIFY!

4. $f(x) = (x^2 - 1)^{\frac{2}{3}}$

Determine where the function is increasing and decreasing. Find the relative extrema. ALWAYS JUSTIFY!

5. $g(t) = 12(1 + \cos t)$ on the interval $(0, 2\pi)$

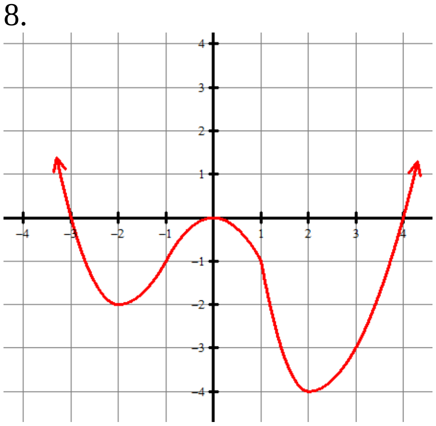
A particle moves along the x-axis with the position function given below. Find the velocity and use a sign chart to describe the motion of the particle.

6. $h(x) = -x^5 + \frac{5}{2}x^4 + \frac{40}{3}x^3 + 5$

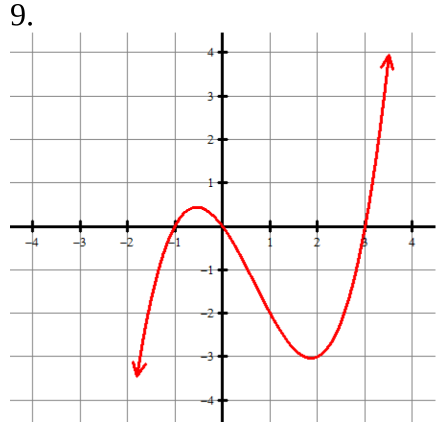
7. $g(x) = e^{\cos x}$ on the interval $[0, 2\pi]$

Given the graph of $f'(x)$, find the critical points and locate all relative extrema.

8.

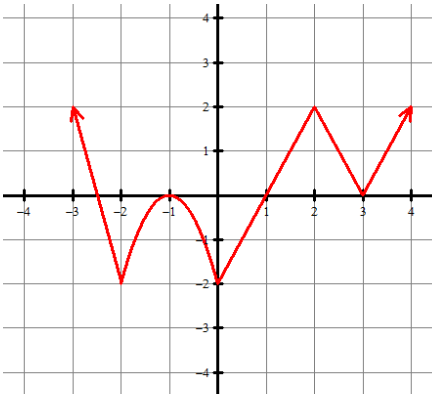


9.

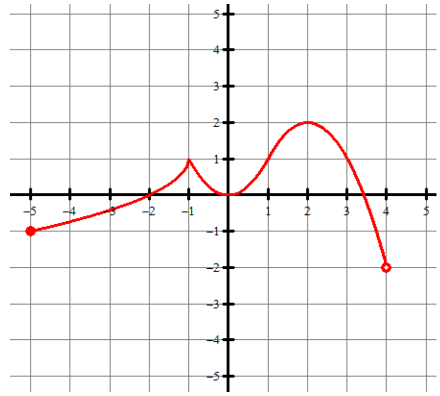


Given the graph of $f'(x)$, find the critical points and locate all relative extrema.

10.

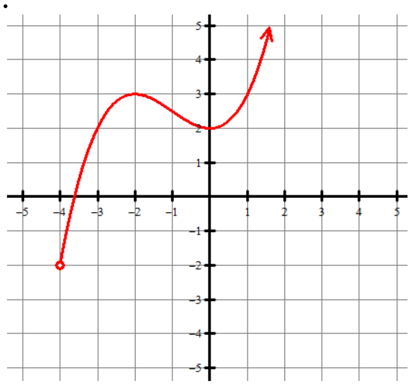


11.

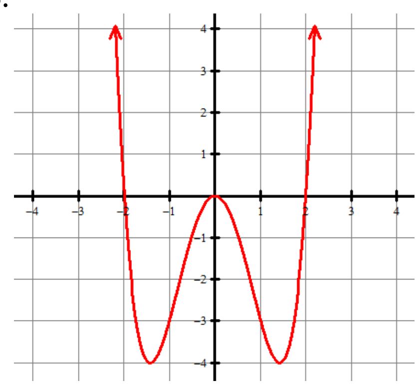


Given the $f(x)$, sketch an approximate graph of $f'(x)$.

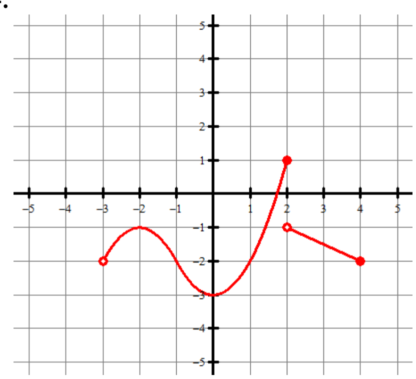
12.



13.



14.



Given the $f(x)$, find the following and sketch a graph of $f(x)$.

15. $f(x) = \frac{x^2-4}{2x^2-2}$

Domain:

Horizontal Asymptote(s)

$\lim_{x\to\infty} f(x) =$

$\lim_{x\to-\infty} f(x) =$

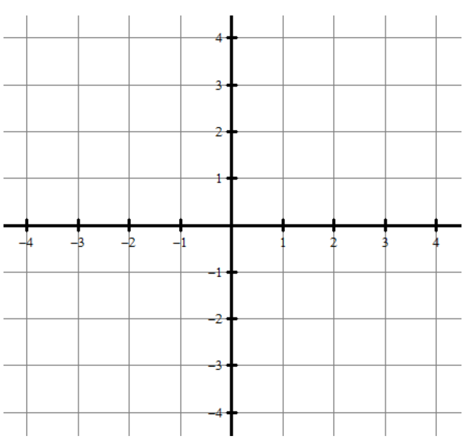
Vertical Asymptote(s):

x-intercept(s):

y-intercept:

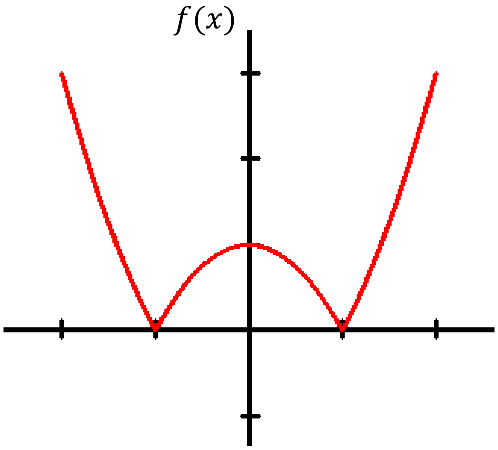
Make sign chart showing:

- Extrema
- Interval(s) where $f(x)$ increasing
- Interval(s) where $f(x)$ decreasing

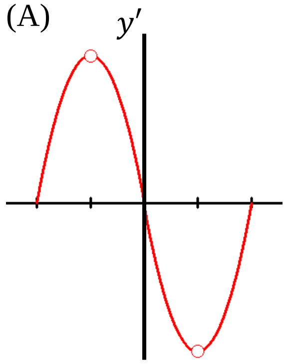


MULTIPLE CHOICE

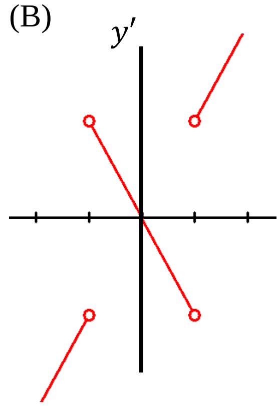
1. The graph of $y = f(x)$ is shown below. Which of the following graphs could be the derivative?



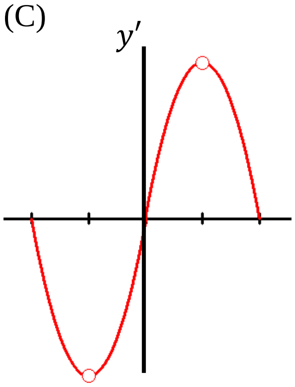
(A)



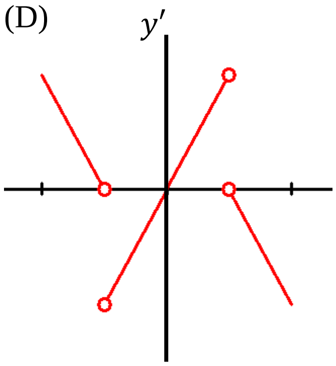
(B)



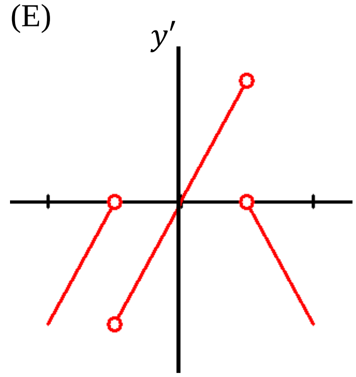
(C)



(D)



(E)



2. Consider the graph of the function $f(x) = \sqrt[3]{x}$. Which of the following is true?

(A) f has a horizontal tangent $x = 0$.
(B) f has a vertical tangent $x = 0$.
(C) The slope of the tangent to the curve is increasing on the interval $(-1, 1)$.
(D) Both (A) and (C)
(E) Both (B) and (C)

3. Given $f(x) = 2x^2 - 7x - 10$, find the absolute maximum of $f(x)$ on $[-1, 3]$.

(A) -1

(B) $\frac{7}{4}$

(C) -13

(D) $-\frac{129}{8}$

(E) 0

4. If g is a differentiable function such that $g(x) < 0$ for all real numbers x, and if $f'(x) = (x^2 - 9)g(x)$, which of the following is true?

   (A) f has a relative maximum at $x = -3$ and a relative minimum at $x = 3$.

   (B) f has a relative minimum at $x = -3$ and a relative maximum at $x = 3$.

   (C) f has relative minima at $x = -3$ and $x = 3$.

   (D) f has relative maxima at $x = -3$ and $x = 3$.

   (E) It cannot be determined if f has nay relative extrema.

5. An equation of the line tangent to the graph of $y = 3x - \cos x$ at $x = 0$ is

   (A) $y = 2x$

   (B) $y = 2x - 1$

   (C) $y = 3x + 1$

   (D) $y = 3x - 1$

   (E) $y = 4x$

FREE RESPONSE

Your score: ____ out of 4

1. The velocity of a particle moving on the x-axis is given by $v(t) = t^3 - 6t^2$ for the time interval $0 \leq t \leq 10$.

   a. When is the particle farthest to the left? Justify.

   b. When is the velocity of the particle increasing the fastest?