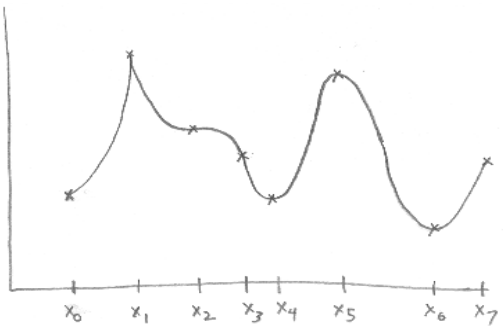
Calculus 1 - Test 3 - Review



Use this graph to fill in the blanks for a-g below:

1. a. f(x) is increasing on the intervals _____.

b. f '(x_3) is _____ (positive, negative, zero, or undefined).

c. f "(x_6) is _____ (positive, negative, zero, or undefined).

d. f '(x) is undefined at _____.

e. The critical points for this function are _____.

f. Point(s) of inflection occur at _____ (use labeled points only).

f. The absolute minimum of this function occurs at _____.

g. This function has relative maxima at _____.

Answer the following questions:

h. (true or false) _____ Every critical point must also be a relative maximum or minimum.

i. x = c is a critical point of f(x) if _____or _____.

j. The second derivative test for a critical point x = c states that if:

if f "(c) > 0 then x = c is a _____

if f "(c) < 0 then x = c is a _____ and

if f "(c) = 0 or is undefined then _____

2. For $f(x) = x^3 - 3x^2 - 9x + 1$, find:

a) the intervals where f(x) increases/decreases and relative max/min values.
b) f(x) is concave up/down and point(s) of inflection.
c) graph f(x), *explicitly* plotting and labeling any max/min and inflection points.

3. Given: $g(x)=\frac{2x(x-2)}{(x-3)^2}$ $g'(x)=\frac{-4(2x-3)}{(x-3)^3}$ and $g''(x)=\frac{4(4x-3)}{(x-3)^4}$

a. compute the x-intercept(s)

b. compute the vertical asymptote(s)

c. compute the horizontal asymptote(s) and show all work!

d. find all critical points

e. use the second derivative test to determine if each critical point is a max or min. (disregard critical values for which f(x) is undefined)

4. Sketch the graph of f(x) if f(x) is a rational function and

- the zeros of f(x) are -2, 1 and 4
- the vertical asympote is at x = 2 and the horizontal asymptote is at y = 1.
- critical values are x= -1/2 and x = 2, f(-1/2) = -2 and f ' (-1/2) = 0.
- f(x) decreases on $(-\infty, -1/2)$ and increases on $(-1/2, 2)$ and $(2, \infty)$.

5. a. Find $\lim_{x\to-\infty}\frac{2x^2+5}{5x^3-10x}$ Show all work.

b. Compute $\lim_{x\to\infty}\frac{(4x+5)(2x+3)}{10-5x^2}$

6. Given $x^3 - y^2 = 3y - 10$. If $\frac{dy}{dt}=4$ when y = 3, find $\frac{dx}{dt}$

7. An upward facing right circular cone is being filled with water at a rate of of 48π cubic feet per minute. If the radius r of the water in the cone is always equals its height h, then how quickly is the radius r of the water changing when $r = 4$. Note: The volume of a cone is V = $\frac{1}{3}\pi r^2 h$