Name Solns A   11/20/07   Chapter 3 Test AP Calculus AB

SHOW ALL OF YOUR WORK. Indicate clearly the methods you use because you will be grade on the correctness of your methods as well as on the accuracy of your final answers. **Still no calculators yet ☺**

For problems 1 and 2 use $f(x) = 4 - x^2$ on [-1, 2]:

1) Demonstrate the mean value theorem to find a c in (a,b) such that $f'(c) = \frac{f(b)-f(a)}{b-a}$

$$f'(c) = -2c = \frac{f(2) - f(-1)}{2 - -1} = \frac{0 - 3}{3} = -1$$

so by MVT, $\boxed{c = \frac{1}{2}}$ ✓ in [-1, 2]

2) Find the extrema for g on the closed interval .

$f'(x) = -2x = 0$

$x = 0$ critical #

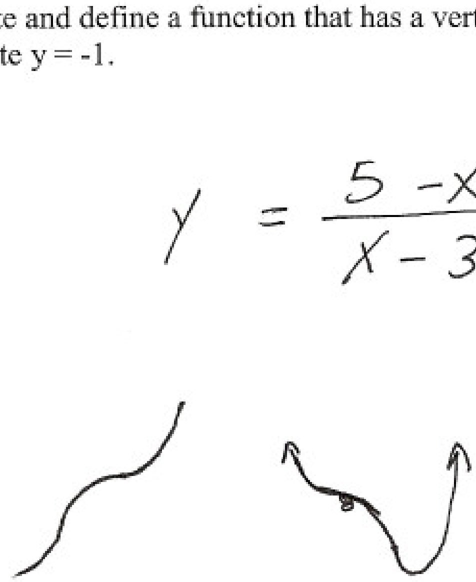
$f(b) = f(2) = 0$ min

$f(a) = f(-1) = 3$ Nuttin honey

$f(0) = 4$ max

3) Create and define a function that has a vertical asymptote x = 3 and a horizontal asymptote y = -1.

$$y = \frac{5 - x}{x - 3}$$ is one example



Name Solns B 11/20/07 Chapter 3 Test AP Calculus AB

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For problems 1 and 2 use $f(x) = x^2$ on [-1, 2]:

1) Demonstrate the mean value theorem to find a c in (a,b) such that $f'(c) = \frac{f(b)-f(a)}{b-a}$

$$f'(c) = 2c = \frac{f(2)-f(-1)}{2--1} = +1$$

so by MVT $\boxed{c = +\frac{1}{2}}$ ✓ in [-1, 2]

2) Find the extrema for g on the closed interval .

$f'(x) = 2x = 0$

$x = 0$ critical #

$f(b) = f(2) = 4$ max

$f(a) = f(-1) = 1$ Nuthin here

$\to f(0) = 0$ min

3) Create and define a function that has a vertical asymptote x = 2 and a horizontal asymptote y = 1.

$$y = \frac{x+5}{x-2}$$ is one example

Solutions 2007

4)

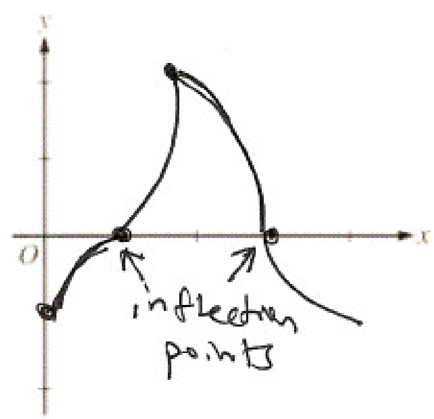
x	0	$0 < x < 1$	1	$1 < x < 2$	2	$2 < x < 3$	3	$3 < x < 4$
$f(x)$	-1	Negative	0	Positive	2	Positive	0	Negative
$f'(x)$	4	Positive	0	Positive	DNE	Negative	-3	Negative
$f''(x)$	-2	Negative	0	Positive	DNE	Negative	0	Positive

Let f be a function that is continuous on the interval $[0, 4)$. The function f is twice differentiable except at $x = 2$. The function f and its derivatives have the properties indicated in the table above, where DNE indicates that the derivatives of f do not exist at $x = 2$.

(a) For $0 < x < 4$, find all values of x at which f has a relative extremum. Determine whether f has a relative maximum or a relative minimum at each of these values. Justify your answer.

(b) On the axes provided, sketch the graph of a function that has all the characteristics of f.

$f(2)$ is a max because
$f'(x) > 0$ on $(1, 2)$
$f'(x) < 0$ on $(2, 3)$



5) Use the 2[nd] derivative test on $f(x) = x^4 - 4x^3$ to find all possible max and mins of f.

$f'(x) = 4x^3 - 12x^2 = 0$
$4x^2(x - 3) = 0$
$x = 0 \qquad x = 3$

$f''(x) = 12x^2 - 24x = 0$
$12x(x - 2) = 0$
$x = 0 \qquad x = 2$

$(-\infty, 0)$ $f''(x) > 0$ concave up
$(0, 2)$ $f''(x) < 0$ concave down
$(2, \infty)$ $f''(x) > 0$ concave up

$f'(3) = 0$
$f''(3) > 0$
therefore $x = 3$ is a minimum