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This set of WeBWorK problems covers limits and continuity, material in sections 1.5 and 1.6 of Brief Calculus. WeBWorK assignment Set4 is due on 10/18/2012 at 10:00pm EDT.

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1. (1 pt) What number exceeds its square by the maximum amount? Begin by convincing yourself that this number is on the interval [0,1].

Answer: _____.

Answer(s) submitted:

- 1/2

(correct)

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2. (1 pt) Consider the function $f(x) = 4 - 7x^2, \quad -5 \le x \le 1$.

The absolute maximum value is _____
and this occurs at x equals _____
The absolute minimum value is _____
and this occurs at x equals _____

Answer(s) submitted:

- 4
- 0
- 4-7*25
- -5

(correct)

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3. (1 pt) The function

$$f(x) = 4x^3 + 12x^2 + 0x - 3$$

is decreasing on the interval (___ , ___).

It is increasing on the interval ($-\infty$, ___) and the interval (___ ∞).

The function has a local maximum at _____

Answer(s) submitted:

- -2
- 0
- -2
- 0
- -2

(correct)

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4. (1 pt) For $x \in [-10, 10]$ the function f is defined by

$$f(x) = x^6(x-8)^5$$

On which two intervals is the function increasing?
_____ to _____
and
_____ to _____

Find the region in which the function is positive:
_____ to _____

Where does the function achieve its minimum? _____

Answer(s) submitted:

- -10
- 0
- 48/11
- 10
- 8
- 10
- -10

(correct)

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5. (1 pt) Identify the interior critical points and find the maximum value and minimum value of the following function on the given interval.

$f(x) = x^3 - 3x + 1$, over $[-3/2, 3]$.

Critical Points: _____, _____.
Maximum: _____.
Minimum: _____.

Instructions:
1) When entering the critical points, please enter them in the order that they appear on the real line.
2) If the function has no critical points, enter the string NONE in all answer boxes for critical points.

Some treatments of Calculus such as Varberg, Purcell, and Rigdon include the endpoints of a closed interval among its critical points,
while others do not, and would not require us exclude them with the word 'interior'.

Answer(s) submitted:

- -1
- 1
- 27-9+1
- -1

(correct)

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6. (1 pt) Find the length of the shortest line from the origin to the line $y = 1 - 8x$.

$d =$_____

Answer(s) submitted:

-

(incorrect)

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7. (1 pt) A rectangle is to be drawn in the first quadrant with one leg on the y-axis, and the other on the x-axis, and a vertex on the curve $y = 1 - 0.03x^2$. Find the coordinates of that vertex which form the rectangle of greatest area.

$x =$_____
$y =$_____

Answer(s) submitted:

-
-

(incorrect)

8. (1 pt) The illumination at a point is inversely proportional to the square of the distance of the point from the light source and directly proportional to the intensity of the light source. If two light sources are 50 feet a and their intensities are 60 and 30 respectively, at what point between them will the sum of their illuminations be a minimum?

Solution:

Let x be the distance from the brighter source at which the sum of the illuminations is a minimum. Then

$x =$ _____ feet.

Answer(s) submitted:

-

(incorrect)

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9. (1 pt) A drum in the form of a circular cylinder and open at one of the circular ends, is to be made so as to contain one cubic yard. Find the dimensions of the drum (height h and base radius r) which minimizes the amount of material going into the drum. The surface area of the drum includes the area of the cylinder and the circles at bottom.

$r =$ _____
$h =$ _____

Answer(s) submitted:

-
-

(incorrect)

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10. (1 pt) Consider the function $f(x) = 7x + 2x^{-1}$. For this function there are four important intervals: $(-\infty, A]$, $[A, B)$,$(B, C]$, and $[C, \infty)$ where A, and C are the critical numbers and the function is not defined at B.

Find A _____
and B _____
and C _____

For each of the following intervals, tell whether $f(x)$ is increasing (type in INC) or decreasing (type in DEC).

$(-\infty, A]$: _____
$[A, B)$: _____
$(B, C]$: _____
$[C, \infty)$ _____

Note that this function has no inflection points, but we can still consider its concavity. For each of the following intervals, tell whether $f(x)$ is concave up (type in CU) or concave down (type in CD).

$(-\infty, B)$: _____
(B, ∞): _____

Answer(s) submitted:

-
-
-
-
-
-
-
-
-

(incorrect)

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11. (1 pt) Consider the function $f(x) = 12x^5 + 15x^4 - 240x^3 + 7$.

$f(x)$ has inflection points at (reading from left to right) $x = D$, E, and F

where D is _____
and E is _____
and F is _____

For each of the following intervals, tell whether $f(x)$ is concave up (type in CU) or concave down (type in CD).

$(-\infty, D]$: _____
$[D, E]$: _____
$[E, F]$: _____
$[F, \infty)$: _____

Answer(s) submitted:

-
-
-
-
-
-
-

(incorrect)

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12. (1 pt) Consider the function $f(x) = -2x^3 + 27x^2 - 48x + 7$. For this function there are three important intervals: $(-\infty, A]$, $[A, B]$, and $[B, \infty)$ where A and B are the critical numbers.

Find A _____
and B _____

For each of the following intervals, tell whether $f(x)$ is increasing (type in INC) or decreasing (type in DEC).

$(-\infty, A]$: _____
$[A, B]$: _____
$[B, \infty)$ _____

$f(x)$ has an inflection point at $x = C$

where C is _____

Finally for each of the following intervals, tell whether $f(x)$ is concave up (type in CU) or concave down (type in CD).

$(-\infty, C]$: _____
$[C, \infty)$ _____

Answer(s) submitted:

-
-

-
-
-
-
-
-

(incorrect)

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13. (1 pt) A rancher wants to fence in an area of 500000 square feet in a rectangular field and then divide it in half with a fence down the middle to one side. What is the shortest length of fence that the rancher can use?

Note: the answer is to be the length of fence which is a minimum, not the length of a side which achieves that minimum.

Answer(s) submitted:

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(incorrect)