MATH 150/GRACEY

QUIZ 4/3.4, 3.5, 3.7

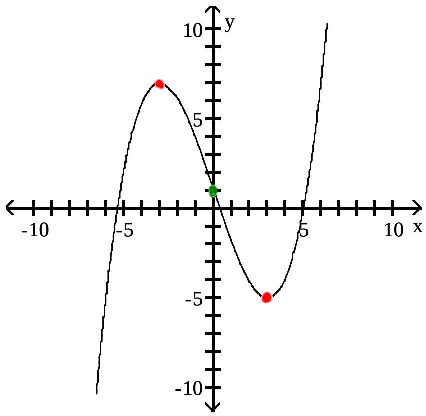
4 POINTS

Name________________________________

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.

1) 1) C



A) Local minimum at $x = 3$; local maximum at $x = -3$; concave down on $(-\infty, -3)$ and $(3, \infty)$; concave up on $(-3, 3)$

B) Local minimum at $x = 3$; local maximum at $x = -3$; concave up on $(-\infty, -3)$ and $(3, \infty)$; concave down on $(-3, 3)$

C) Local minimum at $x = 3$; local maximum at $x = -3$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$

D) Local minimum at $x = 3$; local maximum at $x = -3$; concave down on $(0, \infty)$; concave up on $(-\infty, 0)$

Solve the problem.

2) From a thin piece of cardboard 10 in. by 10 in., square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? What is the maximum volume? Round to the nearest tenth, if necessary. 2) C

A) 6.7 in. × 6.7 in. × 3.3 in.; 148.1 in^3

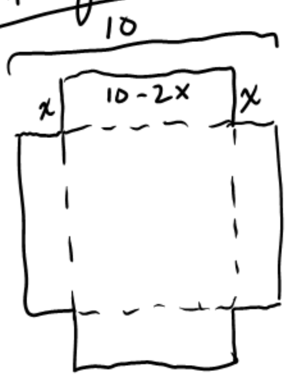
B) 5 in. × 5 in. × 2.5 in.; 62.5 in^3

C) 6.7 in. × 6.7 in. × 1.7 in.; 74.1 in^3

D) 3.3 in. × 3.3 in. × 3.3 in.; 37 in^3

2) From a thin piece of cardboard 10 in. by 10 in., square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? What is the maximum volume? Round to the nearest tenth, if necessary.

① Analysis



② Primary Equation

$$V(x) = (10-2x)^2 x$$

③ Reduce Primary

Already done!!

④ Domain

$x > 0$, $10 - 2x > 0$

$10 > 2x$

$5 > x$

$0 < x < 5$

⑤ Optimize

i) CN

$$V'(x) = 2(10-2x)\cdot(-2)\cdot x + (10-2x)^2 \cdot 1$$

$$V'(x) = (10-2x)\left[-4x + (10-2x)\right]$$

$$V'(x) = (10-2x)(-6x+10)$$

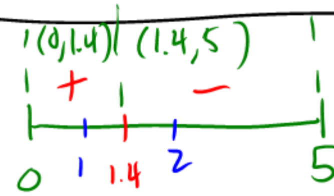
$$V'(x) = 2(5-x)\left[-2(3x-5)\right]$$

$$V'(x) = -4(5-x)(3x-5)$$

$0 = 5 - x$ or $0 = 3x - 5$

$\cancel{x = 5}$ $\qquad x = \frac{5}{3} \approx 1.7$

ii) verify that $x = 1.4$ yields a rel. max



$V'(1) > 0$

$V'(2) < 0$

⑥ Conclusion

$x \doteq 1.7$

$10 - 2x \doteq 10 - 2(1.7) = 6.6$

$\boxed{\text{Dimension that yield the max. volume are } 6.6 \text{ in} \times 6.6 \text{ in} \times 1.7 \text{ in. Max Vol} \doteq 76.3 \text{ in}^3}$

Find all horizontal asymptotes of the given function, if any.

3) $h(x) = \dfrac{8x^3 - 3x}{9x^3 - 6x + 7}$ 3) C

A) $y = \dfrac{1}{2}$ B) $y = 0$

C) $y = \dfrac{8}{9}$ D) no horizontal asymptotes

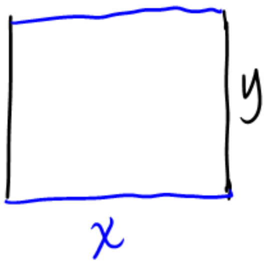
Solve the problem.

4) A rectangular field is to be enclosed on four sides with a fence. Fencing costs $4 per foot for two opposite sides, and $7 per foot for the other two sides. Find the dimensions of the field of area 740 ft^2 that would be the cheapest to enclose. 4) C

① Analysis

Let x be the $7/ft fencing length

Let y be the $4/ft fencing length



$x \cdot y = 740 \rightarrow x = \dfrac{740}{y}$

$7 \cdot 2x + 4 \cdot 2y = C(x,y)$

② Primary Equation

$C(x,y) = 14x + 8y$

③ Reduce Primary

$C(y) = 14\left(\dfrac{740}{y}\right) + 8y$

④ Domain

$x > 0,\ y > 0$

⑤ Optimize

$C(y) = 10360y^{-1} + 8y$

i) CN

$C'(y) = -\dfrac{10360}{y^2} + 8$

$0 = -\dfrac{10360}{y^2} + 8$

$\dfrac{10360}{y^2} = 8$

$y^2 = 1295$

$y = \cancel{\pm}\, 36$

ii) Verify that y = 36 yields a rel. min

$C''(y) = \dfrac{2(10360)}{y^3}$

$C''(36) > 0 \rightarrow$ rel min

⑥ Conclusion

$y = 36$

$x = \dfrac{740}{36} \doteq 20.6$

Dimensions of 20.6 ft of the $7/ft fencing and 36 ft of the $4/ft fencing minimize cost.

A) 15.5 ft @ $4 by 47.6 ft @ $7 B) 20.6 ft @ $4 by 36 ft @ $7

C) 36 ft @ $4 by 20.6 ft @ $7 D) 47.6 ft @ $4 by 15.5 ft @ $7

Answer Key
Testname: M150_Q4_3,4,3,5,3.7

1) C
2) C
3) C
4) C