

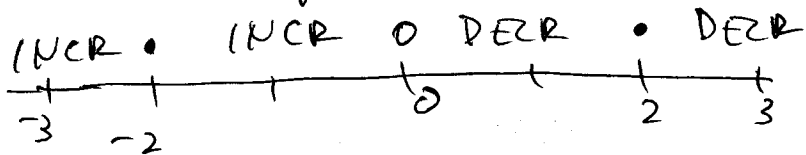
MATH 113 - QUIZ 9 - 13 NOVEMBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (5 pts.) For the function $f(x) = \frac{x^2}{x^2 - 4}$, find all critical points and identify them as local maxima, local minima, or neither.

$$f'(x) = \frac{(x^2 - 4)(2x) - (x^2)(2x)}{(x^2 - 4)^2} = \frac{-8x}{(x^2 - 4)^2}$$

Critical points: $x=0, x=2, x=-2$.



$x=0$ local max
 $x=\pm 2$ neither
 (asymptotes
 of f)

2. (5 pts.) What two nonnegative numbers, x and y , whose sum is 20 minimize $2x^2 + y^2$.

$$x + y = 20 \rightarrow y = 20 - x$$

$$A = 2x^2 + y^2 = 2x^2 + (20 - x)^2$$

$$= 2x^2 + 400 - 40x + x^2$$

$$= 3x^2 - 40x + 400$$

$$A' = 6x - 40$$

$$6x - 40 = 0$$

$$\boxed{x = \frac{20}{3} \quad y = \frac{40}{3}}$$

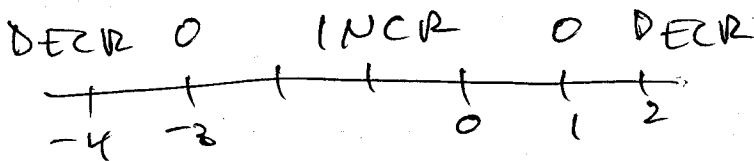
MATH 113 - QUIZ 9 - 13 NOVEMBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (5 pts.) For the function $f(x) = \frac{x+1}{x^2+3}$, find all critical points and identify them as local maxima, local minima, or neither.

$$f'(x) = \frac{(x^2+3)(1) - (x+1)(2x)}{(x^2+3)^2} = \frac{-x^2 - 2x + 3}{(x^2+3)^2} = -\frac{(x-1)(x+3)}{(x^2+3)^2}$$

CP: $x=1, x=-3$



$x=1$ local max
 $x=-3$ local min

2. (5 pts.) What two nonnegative numbers, x and y , whose product is 10 minimize $2x^2 + y^2$.

$$xy = 10 \rightarrow y = \frac{10}{x}$$

$$A = 2x^2 + y^2 = 2x^2 + \frac{100}{x^2}$$

$$A' = 4x - \frac{200}{x^3}$$

$$4x - \frac{200}{x^3} = 0$$

$$4x^4 = 200$$

$$x^4 = 50$$

$$x = (50)^{1/4} \quad y = \frac{10}{(50)^{1/4}} = (20)^{1/4}$$

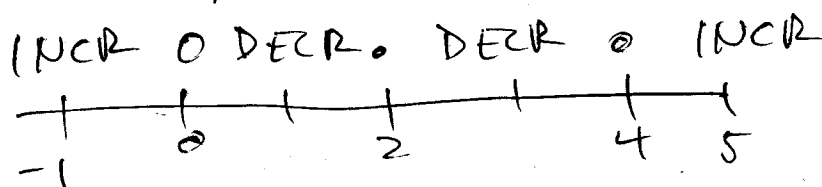
MATH 113 - QUIZ 9 - 13 NOVEMBER 2012

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (5 pts.) For the function $f(x) = \frac{x^2}{x-2}$, find all critical points and identify them as local maxima, local minima, or neither.

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

CP: $x=0, x=4, x=2$



$x=0$ local max
 $x=2$ neither
 (v. asymptote)
 $x=4$ local min

2. (5 pts.) What two nonnegative numbers, x and y , that satisfy $x^2y = 100$ minimize $x^2 + 4xy$.

$$x^2y = 100 \rightarrow xy = \frac{100}{x}$$

$$A = x^2 + 4xy = x^2 + \frac{400}{x}$$

$$A' = 2x - \frac{400}{x^2}$$

$$2x - \frac{400}{x^2} = 0$$

$$2x^3 = 400$$

$$x^3 = 200$$

$$\boxed{x = (200)^{1/3} \quad y = \frac{100}{(200)^{2/3}} = \frac{1}{2} (200)^{1/3}}$$