Suppose that

$$f(x) = \frac{2x-5}{x+2}.$$

(A) Find all critical values of f. If there are no critical values, enter *None*. If there are more than one, enter them separated by commas.
Critical value(s) = ☐

(B) Use interval notation to indicate where $f(x)$ is increasing. If it is increasing on more than one interval, enter the union of all intervals where $f(x)$ is increasing.
Increasing: ☐

(C) Use interval notation to indicate where $f(x)$ is decreasing. If it is decreasing on more than one interval, enter the union of all intervals where $f(x)$ is decreasing.
Decreasing: ☐

(D) Find the x-coordinates of all local maxima of f. If there are no local maxima, enter *None*. If there are more than one, enter them separated by commas.
Local maxima at x = ☐

(E) Find the x-coordinates of all local minima of f. If there are no local minima, enter *None*. If there are more than one, enter them separated by commas.
Local minima at x = ☐

(F) Use interval notation to indicate where $f(x)$ is concave up.
Concave up: ☐

(G) Use interval notation to indicate where $f(x)$ is concave down.
Concave down: ☐

(H) Find all inflection points of f. If there are no inflection points, enter *None*. If there are more than one, enter them separated by commas.
Inflection point(s) at x = ☐

Concave down: ☐

(H) Find all inflection points of f. If there are no inflection points, enter *None*. If there are more than one, enter them separated by commas.
Inflection point(s) at x = ☐

(I) Find all horizontal asymptotes of f. If there are no horizontal asymptotes, enter *None*. If there are more than one, enter them separated by commas.
Horizontal asymptote(s): y = ☐

(J) Find all vertical asymptotes of f. If there are no vertical asymptotes, enter *None*. If there are more than one, enter them separated by commas.
Vertical asymptote(s): x = ☐

(K) Use all of the preceding information to sketch a graph of f. When you're finished, enter a **1** in the box below.
Graph Complete: ☐

Note: *You can earn partial credit on this problem.*

$f(x) = \frac{2x-5}{x+2}$ domain $x+2 \neq 0$ $x \neq -2$

$(-\infty,-2) \cup (-2,\infty)$

Critical points

$$f'(x) = \frac{(2x-5)'(x+2) - (2x-5)(x+2)'}{(x+2)^2} = \frac{2(x+2) - (2x-5)(1)}{(x+2)^2} =$$

quotient rule

$$\frac{\cancel{2x}+4-\cancel{2x}+5}{(x+2)^2} = \frac{9}{(x+2)^2}$$

$f'(x) = 0$ NUMERATOR $= 0$ $9 = 0$ Never true

A) Critical points: $\boxed{\text{NONE}}$

B) - C) Sign chart for $f'(x) = \frac{9}{(x+2)^2}$

zero of numerator NONE
zero of denominator -2

$f \nearrow$ $f \nearrow$

$+ + + + + + +$ -2 $+ + + + + +$

Test $x = -3$ Test $x = 0$

$f'(-3) = \frac{9}{(-3+2)^2} = \frac{9}{(-1)^2} =$ $f'(0) = \frac{9}{4} > 0$

$9 > 0$

Increasing $\boxed{(-\infty,-2) \cup (-2,\infty)}$

Note: $x = -2$ is not in the domain

Desreasing $\boxed{\{\ \}}$ notation for "empty" interval (from WW instructions)

D-E

Local max $\boxed{\text{NONE}}$

Local min $\boxed{\text{NONE}}$

F - G - H 2nd derivative sign chart for $f''(x)$

$$f'(x) = \frac{9}{(x+2)^2}$$

$$f''(x) = \frac{\overbrace{(9)'}^{=0 \text{ because } 9'=0}(x+2)^2 - 9\left[(x+2)^2\right]'}{\left[(x+2)^2\right]^2} = \frac{-9\left[2(x+2)^1 (x+2)'\right]}{(x+2)^4}$$

quotient rule

$$= \frac{-18(x+2)}{(x+2)^4} = \frac{-18}{(x+2)^3}$$

other way: $f'(x) = 9 (x+2)^{-2}$ ← constant

$$f''(x) = 9(-2)(x+2)^{-3} = -18(x+2)^{-3} = \frac{-18}{(x+2)^3}$$

power rule

$$f''(x) = \frac{-18}{(x+2)^3}$$

$-18 = 0$ NEVER

$x+2=0$ $x=-2$

f C.U.		f C.D
+ + + + + +	-2	- - - - - -

zero of denominator

$$f''(-3) = \frac{-18}{(-3+2)^3} = \frac{-18}{(-1)^3} = \frac{-18}{-1} = 18 > 0$$

$$f''(0) = \frac{-18}{8} < 0$$

C.U $\boxed{(-\infty, -2)}$ C.D $\boxed{(-2, \infty)}$

Inflection points $\boxed{\text{none}}$

Asymptotes $f(x) = \frac{2x-5}{1x+2}$

H.A $\lim_{x \to \pm\infty} \frac{2x-5}{x+2} \overset{H}{=} \frac{\infty}{\infty} \quad \lim_{x\to\pm\infty} \frac{2}{1} = \lim_{x\to\pm\infty} 2 = 2$

$\boxed{y=2}$

Note: numerator and denominator have both same degree (1)

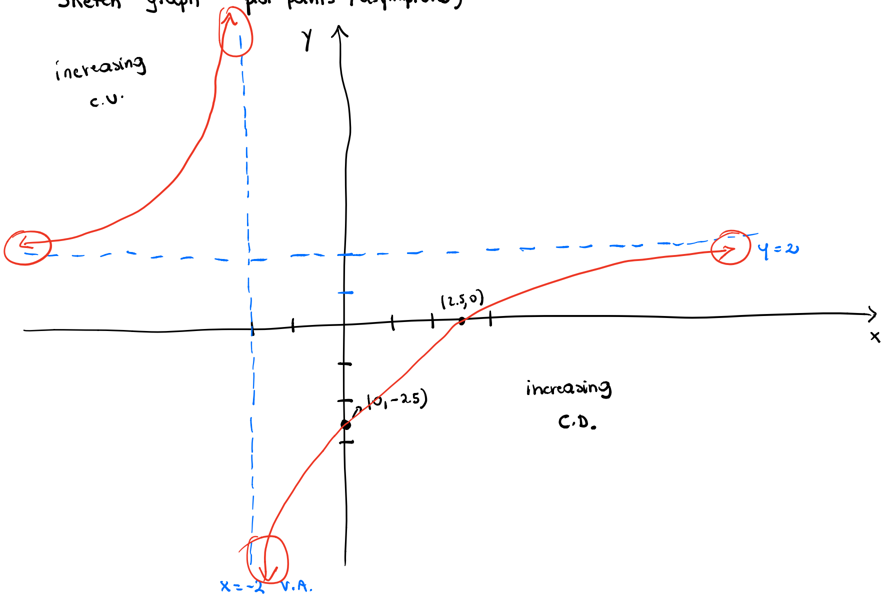
so H.A. $y = \frac{2}{1}$ $\quad y=2$

V.A. $x+2=0$ $x=-2$ possible

$\lim_{x\to -2} \frac{2x-5}{x+2} = \frac{-9}{0}$ infinite limit so $\boxed{x=-2}$ is V.A.

Note: $f(x) = \frac{2x-5}{x+2}$ is simplified so $x=-2$ is V.A.

Sketch graph plot points (asymptotes)



Hint: plot x-y intercepts $f(x) = \frac{2x-5}{x+2}$

y-int $x = 0$ $(0, -2.5)$

$f(0) = -5/2 = -2.5$

x-int $y = 0$

numerator $= 0$

$2x - 5 = 0$

$\frac{2x}{2} = \frac{5}{2}$ $x = 2.5$ $(2.5, 0)$

#3 ww (algebra part)

$$f(x) = \frac{4}{(x^2-25)} = 4(x^2-25)^{-1}$$

$$f'(x) = \frac{\cancel{(4)'(x^2-25)}^{0} - 4(x^2-25)'}{(x^2-25)^2} = \frac{-4(2x)}{(x^2-25)^2} = \frac{-8x}{(x^2-25)^2}$$

critical point $\frac{-8x}{-8} = \frac{0}{-8}$ $\boxed{x = 0}$

Note (for hw) $f(x) = \frac{4}{x^2-25}$

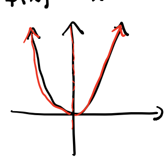
$f(-x) = \frac{4}{(-x)^2-25} = \frac{4}{x^2-25}$

f is even

f is even because $f(x) = f(-x)$

the graph is symmetric with respect to y-axis

Ex $f(x) = x^2$



$$f'(x) = \frac{-8x}{(x^2-25)^2}$$

chain rule

$$2(x^2-25)^{2-1}(x^2-25)' =$$
$$2(x^2-25)(2x)$$

$$f''(x) = \frac{(-8x)'(x^2-25)^2 - (-8x)\left[(x^2-25)^2\right]'}{(x^2-25)^4}$$

$$= \frac{-8(x^2-25)^2 + 8x\left[2(x^2-25)\ (2x)\ \right]}{(x^2-25)^4}$$

$$= \frac{-8(x^2-25)^2 \boxed{+} 32x^2(x^2-25)}{(x^2-25)^4} =$$

factor $8(x^2-25)$

$$= \frac{8(x^2-25)\left[-(x^2-25) + 4x^2\right]}{(x^2-25)^4} =$$

$$= \frac{8(x^2\cancel{-25})\left[-x^2+25+4x^2\right]}{(x^2-25)^{\cancel{4}\,3}} = \frac{8\left[3x^2+25\right]}{(x^2-25)^3} = f''(x)$$

$$\frac{8\left[3x^2+25\right]}{(x^2-25)^3} = 0$$

$8(3x^2+25) = 0$ NEVER

$8 \neq 0$

$3x^2+25=0$

$3x^2=-25$

NO I.P.

Report bugs

Problems

All of the answers above are correct.

(1 point) **Library/UVA-Stew5e/setUVA-Stew5e-C04S05-CurveSketch/4-5-07.pg**
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Increasing: $(-\infty,-2)U(-2,\infty)$

(C) Use interval notation to indicate where $f(x)$ is decreasing. If it is decreasing on more than one interval, enter the union of all intervals where $f(x)$ is decreasing.
Decreasing: $\{\}$

(D) Find the x-coordinates of all local maxima of f. If there are no local maxima, enter *None*. If there are more than one, enter them separated by commas.
Local maxima at x = *none*

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Concave up: $(-\infty,-2)$

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Concave down: $(-2,\infty)$

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Graph Complete: 1

Note: *You can earn partial credit on this problem.*

Edit3

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