

Math 113

Group Quiz 17 Solutions

① a) $r(x) = \frac{2x+6}{-6x+3} = \frac{2(x+3)}{-3(2x-1)}$

x-intercept: set $y = r(x) = 0 \rightarrow x+3=0 \rightarrow x = -3$ $\rightarrow (-3, 0)$ x-int [2]

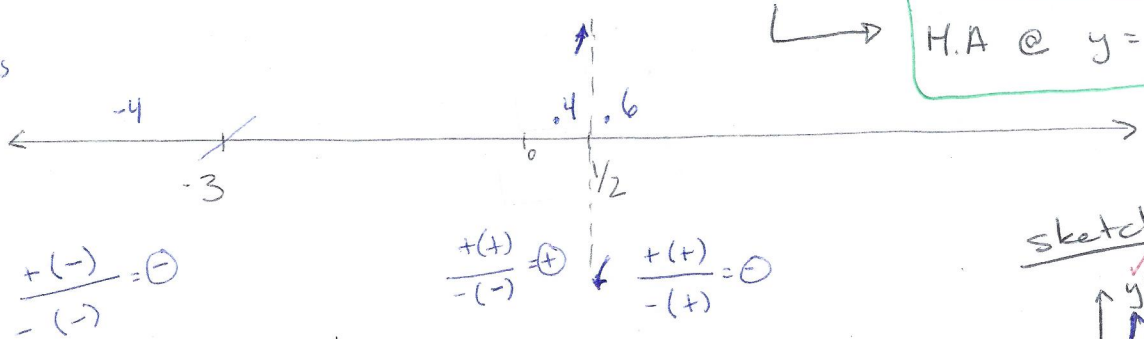
y-intercept: set $x=0 \rightarrow r(0) = \frac{6}{3} = 2 \rightarrow (0, 2)$ y-int [2]

V.A: set $-6x+3 = -3(2x-1) = 0$ (denominator) $\rightarrow 2x-1=0 \rightarrow x = \frac{1}{2}$ \rightarrow v.A @ $x = \frac{1}{2}$ [2]

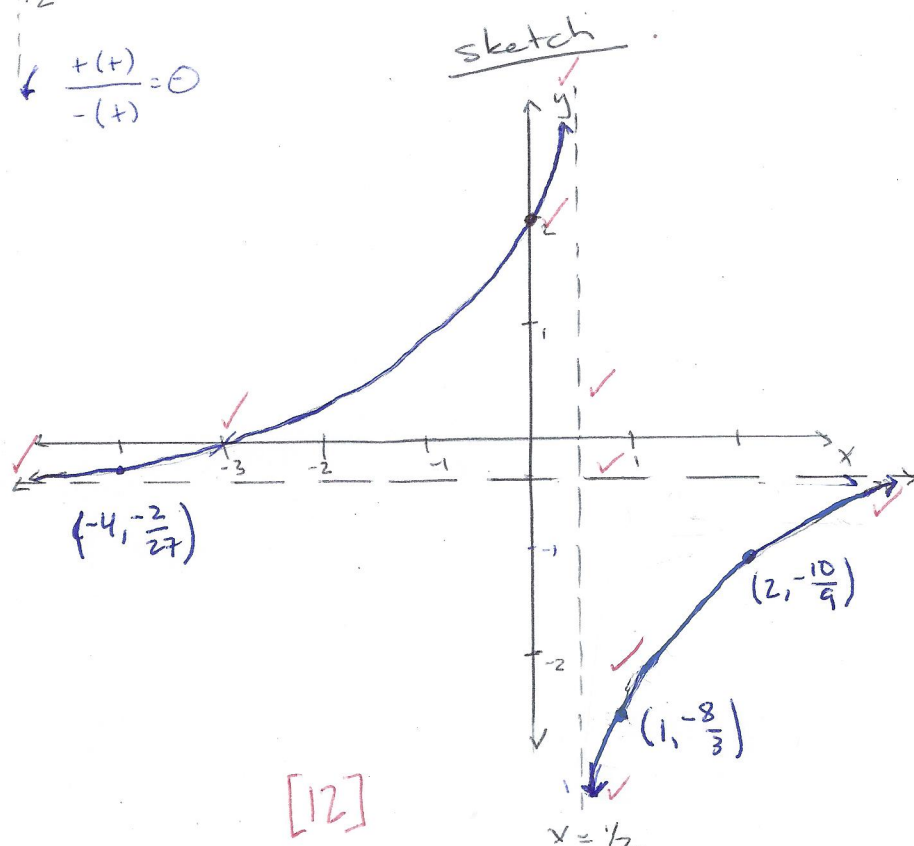
H.A: since degree of numerator = degree of denominator $y \rightarrow \frac{2}{-6} = -\frac{1}{3}$ as $x \rightarrow \pm \infty$

\rightarrow H.A @ $y = -\frac{1}{3}$ [2]

Test Values [5] tests



x	+ undefined?	zero asymptote test point?	value r(x)
-4	-	Test point	$-\frac{2}{27}$
-3	zero	zero	0
0	+	test point	2
.4	+	test point	big
.6	-	test point	-big
1	-	test point	$-\frac{8}{3} = -2\frac{2}{3}$
2			$-\frac{10}{9}$



[12]

$$b) r(x) = \frac{2x-4}{x^2+x-2} = \frac{2(x-2)}{(x+2)(x-1)}$$

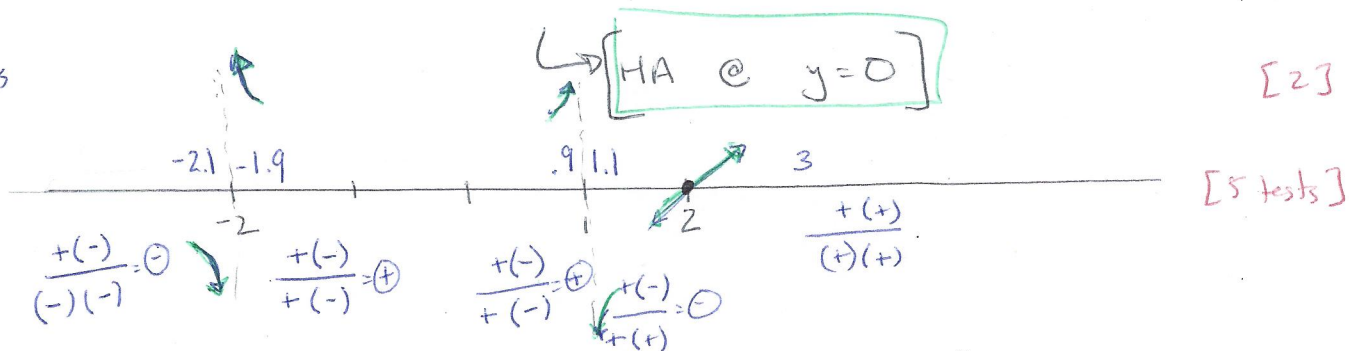
x-int: $y = r(x) = 0 \rightarrow x-2 = 0 \rightarrow x=2 \rightarrow (2, 0)$ x-int [2]

y-int: $x=0 \rightarrow r(0) = \frac{-4}{-2} = 2 \rightarrow (0, 2)$ y-int [2]

VA: set denominator = 0 $(x+2)(x-1) = 0 \rightarrow$ [VA @ $x = -2, x = 1$] [2]

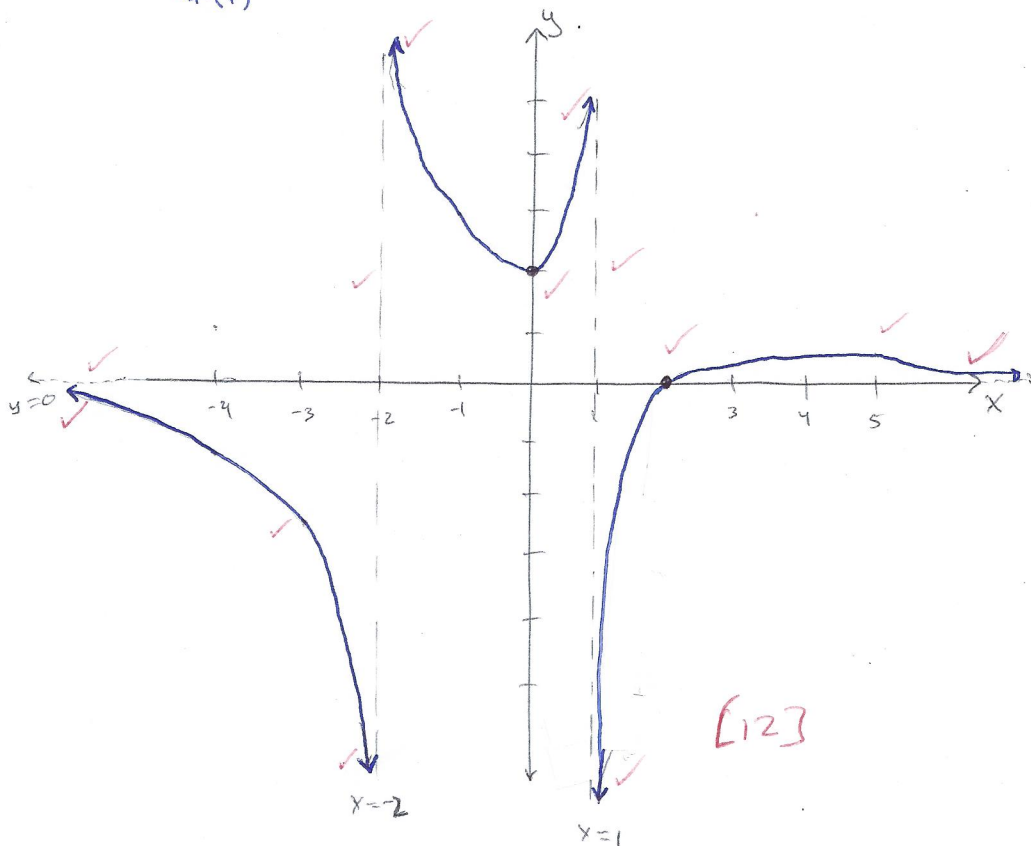
HA: since $\deg(N) < \deg(D)$ $y \rightarrow 0$ as $x \rightarrow \pm\infty$

Test Points



extra test points

x	r(x)
-4	-1.2
-3	-2.5
-1	3
3	.2
5	.21
10	.15



[12]

$$c) r(x) = \frac{4x^2}{x^2 - 2x - 3} = \frac{4x^2}{(x-3)(x+1)}$$

x-int: set $r(x) = 0 \rightarrow 4x^2 = 0 \rightarrow$

$(0,0)$ x-int

[2]

y-int: set $x = 0 \rightarrow r(0) = 0 \rightarrow$

$(0,0)$ y-int

note: this zero has multiplicity $m=2$

VA: set denominator = 0 $(x-3)(x+1) = 0$

VA @ $x=3, x=-1$

[2]

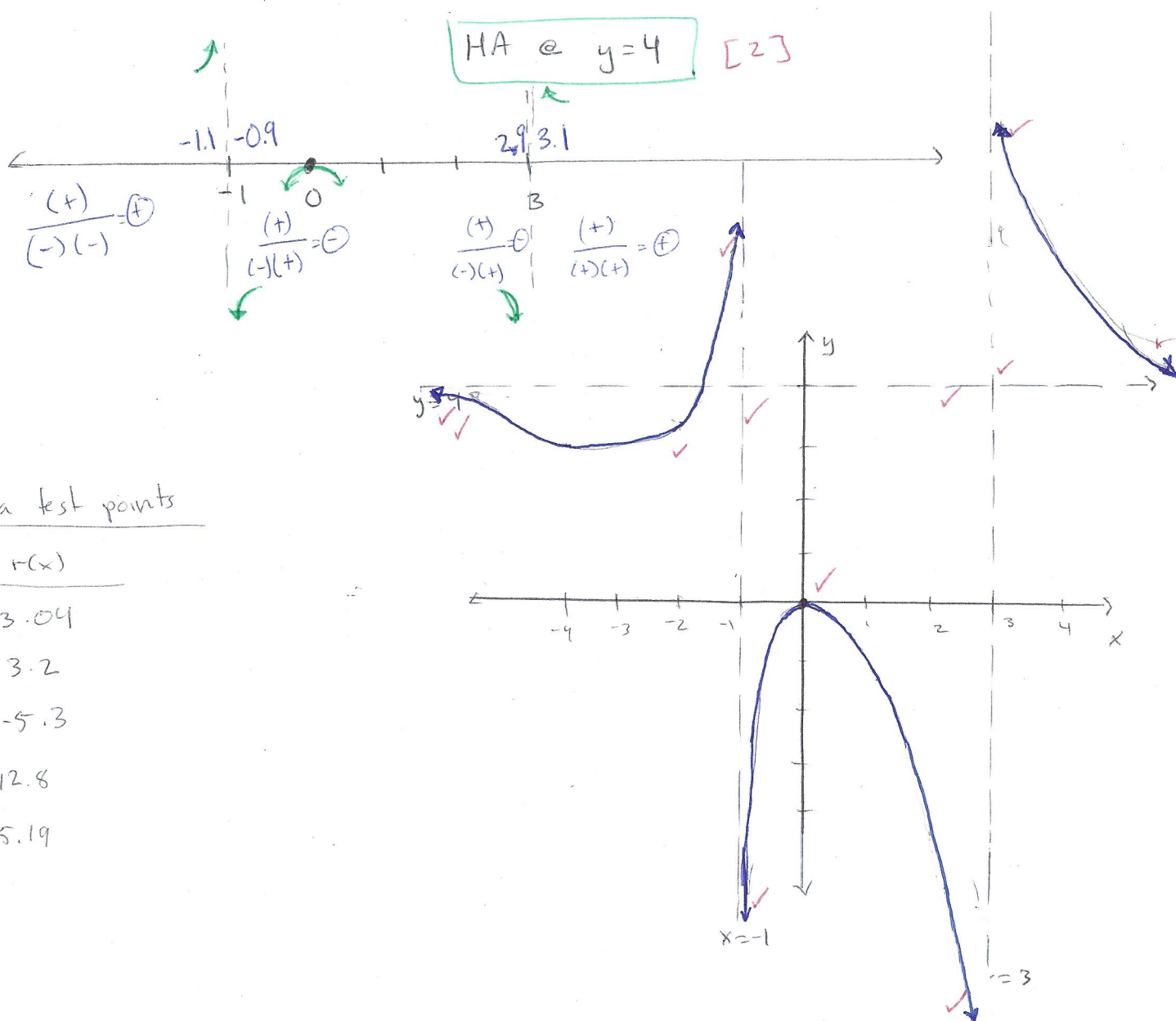
HA: $\deg(N) = \deg(D) \rightarrow y \rightarrow \frac{4}{1} = 4$ as $x \rightarrow \pm\infty$

HA @ $y=4$

[2]

Test Points

[5] tests



extra test points

x	r(x)
-4	3.04
-2	3.2
2	-5.3
4	12.8
10	5.19

[12] graph

$$d) r(x) = \frac{2x^2 + 2x - 4}{x^2 + x} = \frac{2(x^2 + x - 2)}{x(x+1)} = \frac{2(x+2)(x-1)}{x(x+1)}$$

x-int: $r(x)=0$ when $x=-2, x=1$ → $(-2,0) (1,0)$ x-int [2]

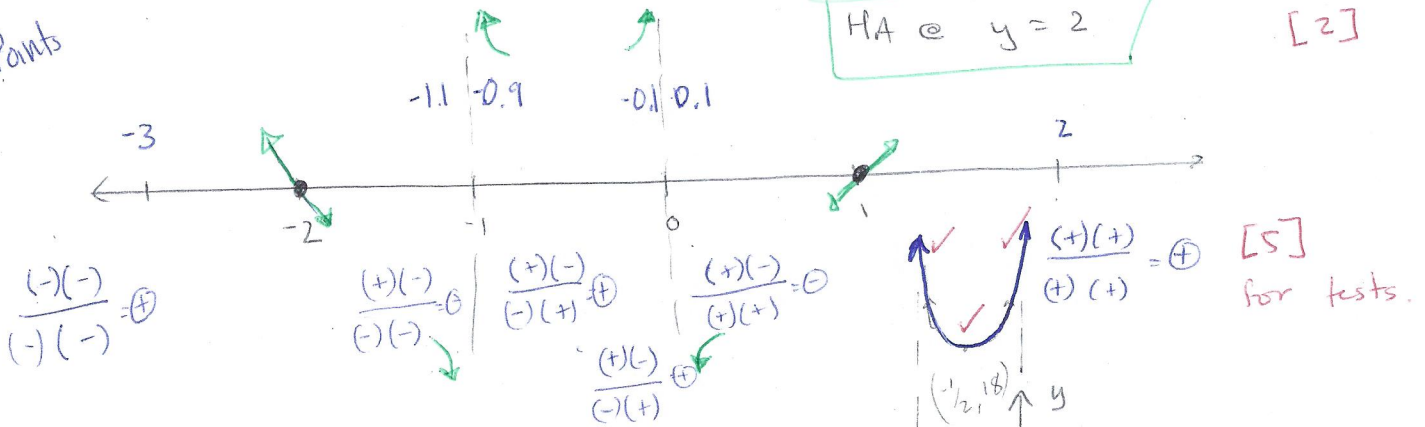
y-int: $x=0$ → $r(0)$ = undefined no y-int [2]

V.A: set denominator = 0 $x(x+1)=0$ when $x=0$ or $x=-1$
VA @ $x=0, x=-1$ [2]

HA: $\deg(N) = \deg(D)$ → $y \rightarrow 2$ as $x \rightarrow \pm\infty$

HA @ $y=2$ [2]

Test Points



extra test points

x	r(x)
-10	1.95
-3	1.3
-1/2	1.8
1/2	-3.3
3	1.67
10	1.96

