MTH30 Homework Section 2.6

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#4 $g(x) = \dfrac{2x^2}{(x-2)(x+6)}$

Solution: $x-2=0$ $\quad x+6=0$

$x=2$ $\quad x=-6$ - exclude

Answer: domain: $(-\infty,-6)\cup(-6,2)\cup(2,+\infty)$

or $\{x \mid x \neq -6, 2\}$

#8 $f(x) = \dfrac{x+8}{x^2+64}$

Solution: $x^2+64=0$ no solutions. (in $\mathbb{R}$)

Answer: domain: $\mathbb{R}$

#10 Answer: as $x \to -3^+$, $f(x) \to +\infty$

#11 Answer: as $x \to 1^-$, $f(x) \to -\infty$

#14 Answer: as $x \to \infty$, $f(x) \to 0$

#24 $g(x) = \dfrac{x+3}{x(x-3)}$

Solutions: vertical assymptotes: when denominator is 0: $x(x-3)=0$

Answer: $x=0$, $x=3$ are the vertical assymptotes

#38 $f(x) = \frac{15x}{3x^2+1}$

Solution: $n = 1$ - degree of $15x$

$m = 2$ - degree of $3x^2+1$

therefore $n < m$ ← see p. 345 (book)

Answer: $y = 0$ (x-axis) is the horizontal assymptote of the graph of $f(x)$

#40 $h(x) = \frac{15x^3}{3x^2+1}$

Solution: $n = 3$ - degree of $15x^3$

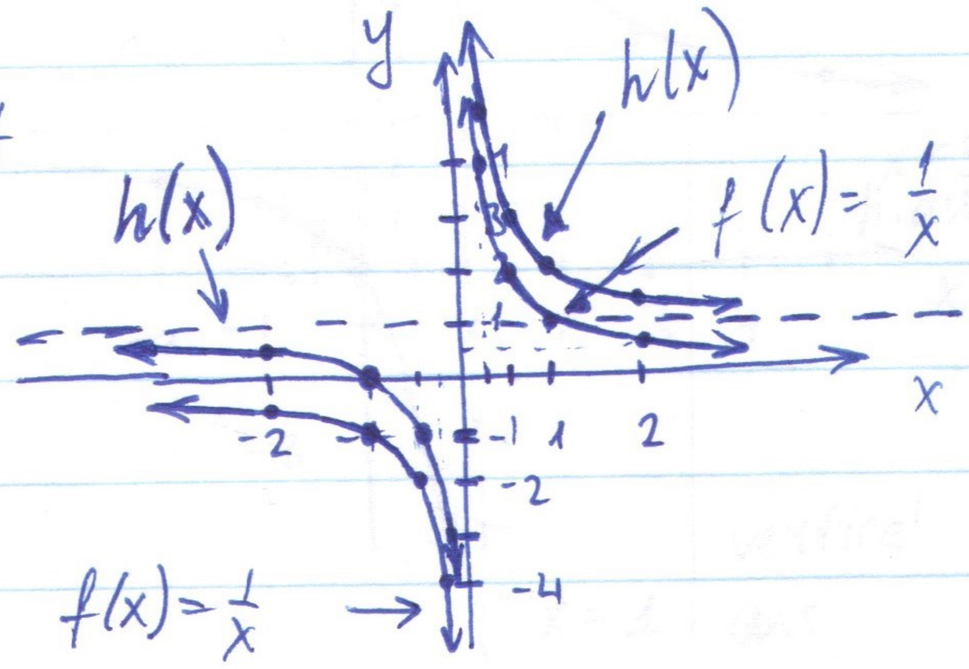
$m = 2$ - degree of $3x^2+1$

therefore $n > m$ ← see page 345 (book)

Answer: the graph of $h(x)$ has no horizontal assymptotes.

#48 use transformations of $f(x) = \frac{1}{x}$ to graph $h(x) = \frac{1}{x} + 1$

Solution: - vertical shift 1 unit up.



#58 graph $f(x) = \frac{3x}{x-1}$

a) $f(-x) = \frac{-3x}{-x-1} = \frac{3x}{x+1}$ $\neq f(x)$ $\neq -f(x)$ neither odd nor even.

b) y-intercept: $f(0) = 0$ $\boxed{(0,0)}$

x-intercept(s):

$3x = 0$ $x = 0$ $\boxed{(0,0)}$

c) $x - 1 = 0$ $\boxed{x = 1}$ ← exclude from the domain

vertical assymptote

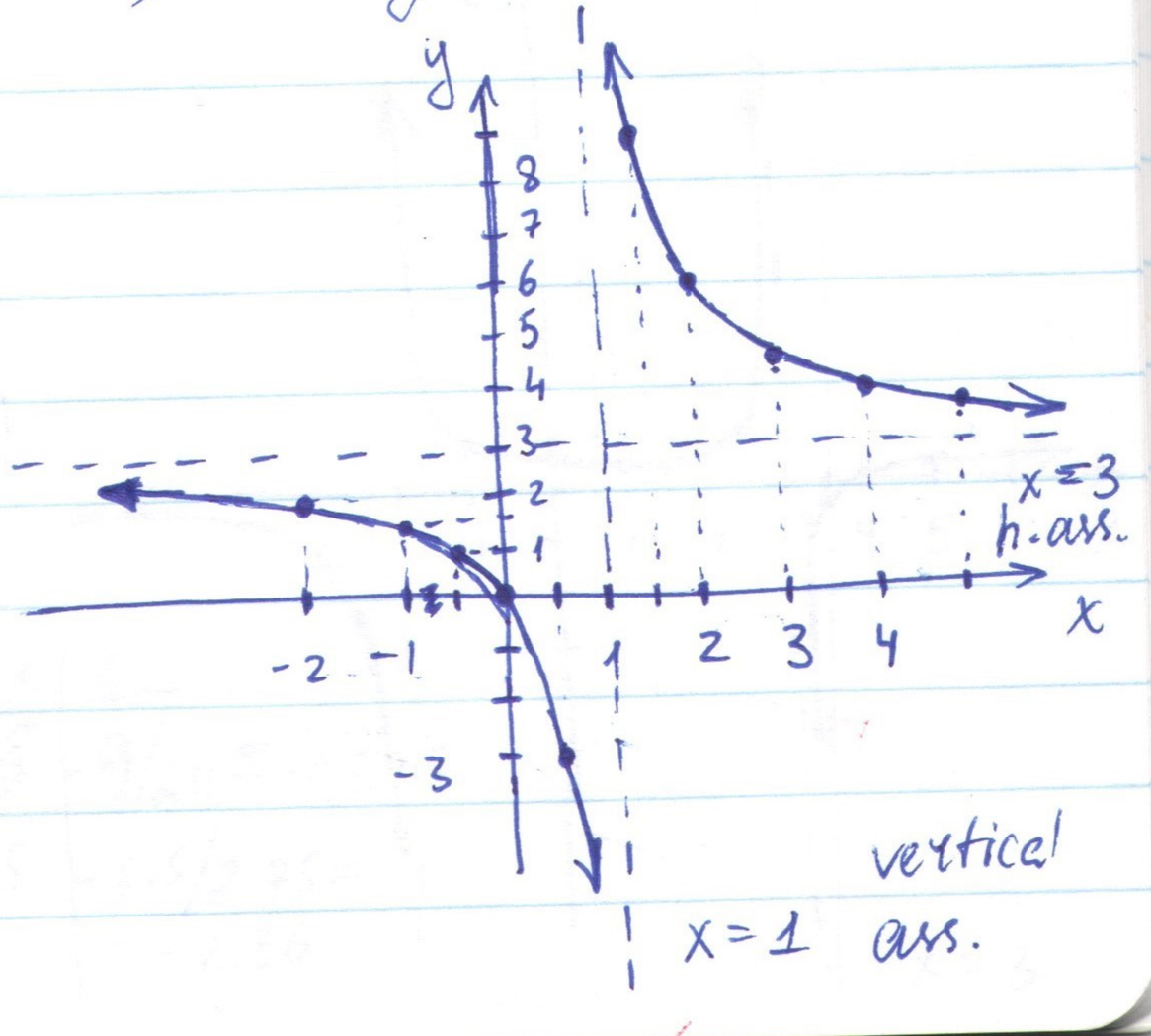
d) horizontal assymptote:

$n = 1$ - degree of $3x$, $m = 1$ - degree of $x-1$

therefore $\boxed{y = \frac{3}{1} = 3}$ - horizontal assymptote

e) plot points between x-intercept and vertical assymptotes, an beyond them.

x	y
-1	$-3/-2 = 1.5$
-2	$-6/-3 = +2$
$-1/2$	$-3/2 / -\frac{3}{2} = 1$
$1/2$	$3/2 / -1/2 = -3$
2	$6/1 = 6$
3	$9/2 = 4.5$
4	$12/3 = 4$
$3/2$	$9/2 / 1/2 = 9$
5	$15/4 = 3.75$



#72 $f(x) = \frac{x-4}{x^2-x-6}$, graph $f(x)$

a) $f(-x) = \frac{-x-4}{x^2+x-6} = -\frac{x+4}{x^2+x-6}$ $\neq f(x)$ $\neq -f(x)$

neither odd nor even.

b) y-intercept: $f(0) = \frac{-4}{-6} = \frac{2}{3}$ $\boxed{(0, \frac{2}{3})}$

x-intercept:

$x - 4 = 0$ $x = 4$. $\boxed{(4,0)}$

c) vertical assymptote:

$x^2 - x - 6 = 0$ $(x-3)(x+2) = 0$

$\boxed{x = 3, -2}$

d) horizontal assymptote: ← x-axis.

$n = 1$, $m = 2$ $n < m$ $\boxed{y = 0}$ horiz. assymptote

e) extra points:

x	y
-1	$-5/-6 = 5/6 \approx 0.8$
1	$-3/-6 = 1/2 = 0.5$
2	$-2/-4 = 1/2$
2.5	$-1.5/-2.25 \approx 0.7 (\frac{2}{3})$
1.5	$-2.5/-5.26 \approx 0.48$
3.5	$-0.5/2.75 \approx -0.2$
5	$1/14 \approx 0.07$
6	$2/24 \approx 0.08$
-3	$-7/6 \approx -1.17$
-4	$-8/14 \approx -0.57$

x	y
-5	$-9/24 \approx -0.375$
-2.5	$-6.5/2.75 \approx -2.36$