Key Review - Unit 10

Factor

(1) $\frac{10}{10a+30} \cdot \frac{a^2+9a-18}{a^2+10a+16} = \frac{10}{10(a+3)} \cdot \frac{(a+1)(a+8)}{(a+2)(a+8)}$

Divide/cancel

$= \boxed{\frac{a+1}{(a+3)(a+2)}}$

(2) $\frac{30a-30}{4} \cdot \frac{54}{30a-30} = \frac{54}{4} = \boxed{\frac{27}{2}}$ reduce

(3) $\frac{5(x+6)}{(x+2)(x+5)} \cdot \frac{(x+2)}{(x+6)(x+9)} = \boxed{\frac{5}{(x+5)(x+9)}}$

(4) $\frac{(v+6)(v+4)}{(v-10)(v-9)} \cdot \frac{(v-9)(v-9)}{(v-7)(v+4)} = \boxed{\frac{(v+6)}{(v-10)}}$

(5) $\frac{3(m-1)}{(m+9)(m-1)} \cdot \frac{m+4}{(m+4)(m+6)} = \boxed{\frac{3}{(m+9)(m+6)}}$

(6) $\frac{(m+4)(m+6)}{7(m+4)} \cdot \frac{(m-8)(m-5)}{(m-5)(m+6)} = \boxed{\frac{m-8}{7}}$

(7) $\frac{2}{7a(a+8)} \cdot \frac{(a+8)(a+5)}{9a^2(a+8)} = \boxed{\frac{2}{63a^3}}$

(8) $\frac{(v+6)(v-5)}{2v(v+6)} \cdot \frac{2v}{9(v+4)} = \boxed{\frac{(v-5)}{9(v+4)}}$

(10) $\frac{(x+5)(x+4)}{(x+4)(x-2)} \cdot \frac{(x-2)(x-7)}{2(x+5)} = \boxed{\frac{(x-7)}{2}}$

(11) $\frac{5x^2(x+4)}{(x+4)} \cdot \frac{1(7x-8)}{2x^2(7x-8)} = \frac{5}{2(x+4)} = \boxed{\frac{5}{2}}$

(12) $\frac{3(3r+2)}{(r+8)(r+3)} \cdot \frac{(r+3)(r-2)}{3(3r+2)} = \boxed{\frac{r-2}{r+8}}$

(13) $\frac{(x+8)(x-3)}{7(x-3)} \cdot \frac{(x-7)}{5(x+8)} = \boxed{\frac{x-7}{7}}$

(14) $\frac{v-8}{(v+9)(v-8)} \cdot \frac{(v+4)(v-1)}{(v+9)(v+4)} = \boxed{\frac{v-1}{(v+9)(v+4)}}$

(15) $\frac{3(n+8)}{n+8} \cdot \frac{(n-10)(n+10)}{7(n-10)} = \boxed{\frac{3(n+10)}{7}}$

(16) Flip the 2nd

$\frac{(n-6)(n+4)}{(n-5)} \cdot \frac{n^2-2n-24}{n-6} \cdot \frac{n^2-5n-24}{n^2+n-72}$

$= \frac{(n-6)(n+4)}{n-6} \cdot \frac{(n-8)(n+3)}{(n+9)(n-8)} = \boxed{\frac{(n+4)(n+3)}{n+9}}$

(17) $\frac{9v^3-27v^2}{5v^3+10v^2} \div \frac{v^2+5v-24}{v^2+10v+16} \rightarrow \frac{9v^3-27v^2}{5v^3+10v^2} \cdot \frac{v^2+10v+16}{v^2+5v-24}$

$= \frac{9v^2(v-3)}{5v^2(v+2)} \cdot \frac{(v+8)(v+2)}{(v+8)(v-3)} = \boxed{\frac{9}{5}}$

(18) $\frac{3k-3}{6k-24} \div \frac{3k}{16k^2-64k} = \frac{3k-3}{6k-24} \cdot \frac{16k^2-64k}{3k}$

$= \frac{3(k-1)}{6(k-4)} \cdot \frac{16k(k-4)}{3k} = \frac{8 \cdot 2 \cdot (k-1)}{2} = \boxed{\frac{8(k-1)}{2}}$

(19) $\frac{n+7}{8(n+2)} \cdot \frac{(n+5)(n+2)}{2(n+7)} = \boxed{\frac{n+5}{16}}$

(20) $\frac{(b+8)(b+6)}{(b+8)(b-9)} \cdot \frac{3(b-9)}{(b+6)} = \boxed{3}$

(21) $\frac{9(v-10)}{10v} \cdot \frac{(v-6)(v+8)}{(v-10)(v+1)} = \boxed{\frac{9(v-6)}{10v}}$

(22) $\frac{(n+7)(n+2)}{n+7} \cdot \frac{(n+1)(n+4)}{3(n+4)} = \boxed{\frac{(n+2)(n+1)}{3}}$

(23) $\frac{2(x-1)}{x+5} \cdot \frac{(x-7)(x+5)}{(x-7)(x-9)} = \boxed{\frac{2(x-1)}{x-9}}$

(24) $\frac{4(n-8)}{n+10} \cdot \frac{(n+10)(n-5)}{(n-8)(n-5)} = \frac{4}{1} = \boxed{4}$

(25) $\frac{(p-7)(p-4)}{(p-7)(p+7)} \cdot \frac{(p-10)(p+7)}{1} = \frac{(p-4)(p-10)}{1} = \boxed{(p-4)(p-10)}$

(26) $\frac{8(p-7)}{p+4} \cdot \frac{(p-4)(p+4)}{(p-7)(p-5)} = \boxed{\frac{8(p-4)}{p-5}}$

(27) $\frac{8(n+5)}{8(5n-7)} \cdot \frac{2n(5n-7)}{n+5} = \frac{2n}{1} = \boxed{2n}$

(28) $\frac{6p(5p-9)}{p+2} \cdot \frac{8(p+2)}{8(5p-9)} = \frac{6p}{1} = \boxed{6p}$

(29) $\frac{(x+10)(x+1)}{(x+10)} \cdot \frac{(x+10)(x+9)}{(x+10)(x-2)} = \boxed{\frac{(x+1)(x+9)}{x-2}}$

(30) $\frac{(x-8)(x+1)}{8(5x+3)} \cdot \frac{3(5x+3)}{(x-8)(x+8)} = \boxed{\frac{x+1}{x-18}}$

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subtracting same denominator

(31) $\frac{5v}{4(v+1)} + \frac{-v+3}{4(v+1)} = \boxed{\frac{4v-3}{4v+4}}$

factor

(32) $\frac{x+5}{2x^2-13x+16} + \frac{x+2}{2x^2-13x+16} = \boxed{\frac{3}{2x^2-13x+16}}$

(33) $\frac{2k-3}{9k(k+4)} + \frac{(k+4)}{9k(k+4)} = \boxed{\frac{3k+1}{9k^2+36k}}$

(34) $\frac{n+1}{n^2-n-2} + \frac{-n+1}{n^2-n-2} = \boxed{\frac{-2}{n^2-n-2}}$

(35) $\frac{3n+1}{(3n-5)3} \cdot \frac{2n}{6} = \frac{n+3}{(3n-5)(3)}$ Add the $\frac{3n-5}{3(3n-5)} + \frac{9n+15}{3(3n-5)}$ combine like terms

$\frac{-9n^2+3n-20}{3(3n-5)} =$

(35) $\frac{12n}{(3n-5)3(3n-5)} - \frac{n+15}{3n-5}\cdot\frac{(3)}{3} = \frac{3n^2-5n}{3(3n-5)} + \frac{-3n-15}{3(3n-5)} = \boxed{\frac{3n^2-8n-15}{3(3n-5)}}$

(36) $\frac{(x+1)3x}{(x+1)x+3} - \frac{5(x+3)}{(x+1)(x+3)} = \frac{3x^2+3x}{(x+1)(x+3)} + \frac{-5x-15}{(x+1)(x+3)}$

$= \boxed{\frac{3x^2-2x-15}{(x+3)(x+1)}}$

(37) $\frac{2}{2x-8} + \frac{5x}{3} = \frac{(3)1}{(3)x-4} + \frac{5x}{3}\cdot\frac{(x-4)}{(x-4)} = \frac{3}{3(x-4)} + \frac{5x^2-20x}{3(x-4)}$

$= \frac{5x^2-20x+3}{3(x-4)}$

(38) $\frac{(2n+1)-3}{(2n+1)5n-2} - \frac{6(5n-2)}{2n+1(5n-2)} = \frac{6n+3}{(2n+1)(5n-2)} + \frac{-30n+12}{(2n+1)(5n-2)}$

$\boxed{\frac{-24n+15}{(5n-2)(2n+1)}}$

(39) $\frac{(x-6)4x}{(x-6)(x-2)} + \frac{5(x-2)}{(x-6)(x-2)} = \frac{4x^2-24x}{(x-6)(x-2)} + \frac{5x-10}{(x-6)(x-2)} = \boxed{\frac{4x^2-19x-10}{(x-4)(x-2)}}$

(40) $\frac{(6)4x}{(6)x+3} + \frac{5x(x+3)}{6(x+3)} \cdot \frac{24x}{6(x+3)} + \frac{5x^2+15x}{6(x+3)}$

$= \boxed{\frac{5x^2+39x}{6(x+3)}}$

(41) $\frac{(a+1)6a}{(a+1)5a+1} - \frac{4(5a+1)}{a+1(5a+1)} = \frac{6a^2+6a}{(a+1)(5a+1)} + \frac{-20a-4}{(a+1)(5a+1)} = \boxed{\frac{6a^2-14a-4}{(a+1)(5a+1)}}$

(42) $\frac{(2)\,26}{(2)6+5} - \frac{3\,(6+5)}{2\,(6+5)} = \frac{46}{2(6+5} + \frac{-36-15}{2(6+5)} = \boxed{\frac{6-15}{2(6+5)}}$

(43) ~~$\frac{2(6)}{(3)2(2p+5)}$~~ $\frac{(3)p-2}{(3)2(2p+5)} + \frac{2\,(2)(2p-5)}{3\,(2)(2p+5)}$

$= \frac{3p-6}{6(2p+5)} + \frac{4(2p-5)}{6(2p+5)} = \frac{3p-6}{6(2p+5)} + \frac{8p+20}{6(2p+5)}$ ~~$11p-26$~~ $\boxed{\frac{11p-14}{6(2p-15)}}$

(44) $\frac{3}{(3)}\,\frac{2}{a-5} - \frac{\cancel{4}2\,(a-5)}{\cancel{6}3\,(a-5)} = \frac{6}{3(a-5)} + \frac{-2a+10}{3(a-5)} = \boxed{\frac{-2a+16}{3(a-5)}}$

(45) $\frac{(a-3)\,(a+6)}{(a-3)\,(a-4)} + \frac{2a\,(a-4)}{(a-3)(a-4)} = \frac{a^2+3a-18}{(a-3)(a-4)} + \frac{2a^2-8a}{(a-3)(a-4)}$

$= \frac{3a^2-5a-18}{(a-3)(a-4)}$

(46) $\frac{2}{m+5} + \frac{\cancel{6}^{2}m}{\cancel{3m+6}\;3(m+2)} = \frac{(m+2)\,2}{(m+2)m+5} + \frac{2m\,(m+5)}{m+2\,(m+5)}$

$= \frac{2m+4}{(m+2)(m+5)} + \frac{2m^2+10m}{(m+2)(m+5)} = \boxed{\frac{2m^2+12m+4}{(m+2)(m+4)}}$

(47) $\frac{(n-3)\,2}{(n-3)\,3} - \frac{6\,(3)}{n-3\,(3)} = \frac{2n-6}{3(n-3)} + \frac{-18}{3(n-3)} = \boxed{\frac{2n-24}{3(n-3)}}$

(48) $\frac{(a-4)\,6a}{(a-4)\,a-2} - \frac{5\,(a-2)}{a-4\,(a-2)} = \frac{6a^2-24a}{(a-4)(a-2)} + \frac{-5a+10}{(a-4)(a-2)}$

$= \boxed{\frac{6a^2-29a+10}{(a-4)(a-2)}}$

(49) $\frac{5v-4}{(5v-4)}\frac{2}{5v+4} + \frac{2}{5v-4}\frac{5v+4}{(5v+4)} = \frac{10v-8+10v+8}{(5v-4)(5v+4)} = \boxed{\frac{20v}{(5v-4)(5v+4)}}$

(50) $\frac{3b6}{2b+6} - \frac{6}{2}\frac{3}{1} = \frac{3b}{b+3} - \frac{3(b+3)}{1(b+3)}$

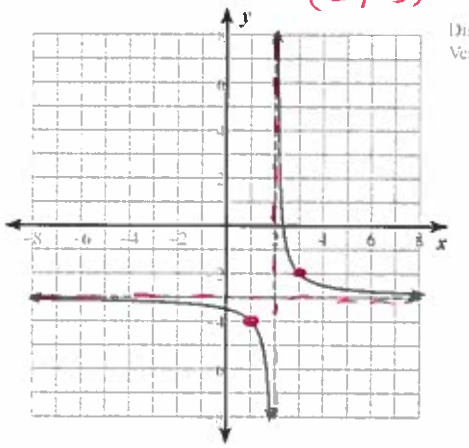
$1\cancel{2}(b+3)$

$\frac{3b}{b+3} + \frac{-3b-9}{b+3} = \boxed{\frac{-9}{b+3}}$

pg 4-5 Even or ODD

Identify ~~the points of discontinuity and vertical asymptotes of each~~. Then sketch the graph.

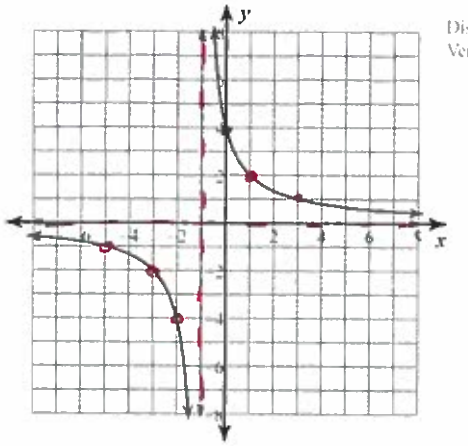
51) $f(x) = \dfrac{1}{x-2} - 3$ $\frac{1}{1}$ and $\frac{1}{1}$ (2, -3)



Discontinuities 2
Vertical Asym $x = 2$

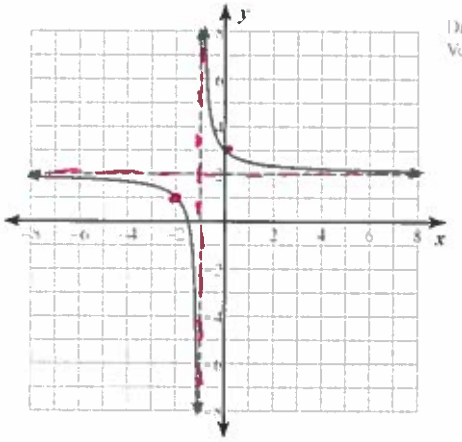
$\sqrt{1} = 1$

52) $f(x) = \dfrac{4}{x+1}$ + 0 (-1, 0)



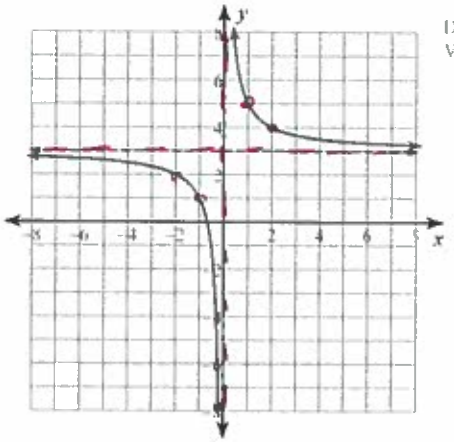
Discontinuities -1
Vertical Asym $x = -1$

53) $f(x) = \dfrac{1}{x+1} + 2$ (-1, 2)



Discontinuities -1
Vertical Asym $x = -1$

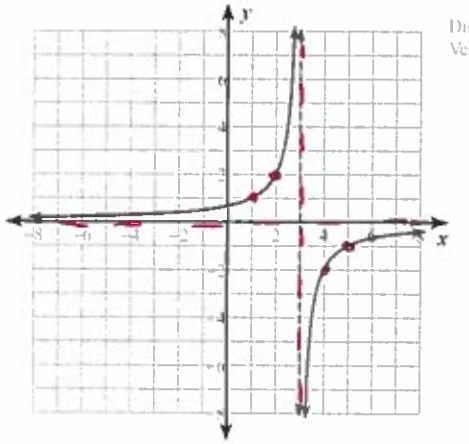
54) $f(x) = \dfrac{2}{x} + 3$ (0, 3)



Discontinuities 0
Vertical Asym $x = 0$

55) $f(x) = -\dfrac{2}{x-3}$

$\frac{-2}{1}$ and $\frac{-1}{2}$

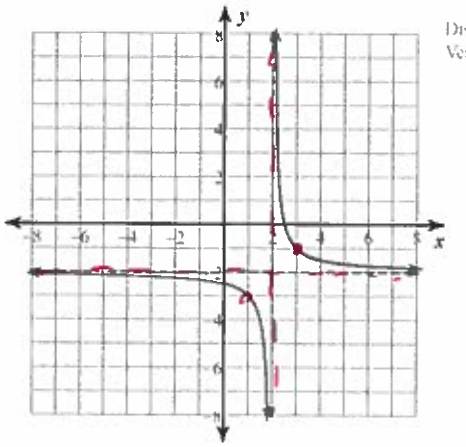


Discontinuities 3
Vertical Asym $x = 3$

(3,0)

56) $f(x) = \dfrac{1}{x-2} - 2$

(2,-2)

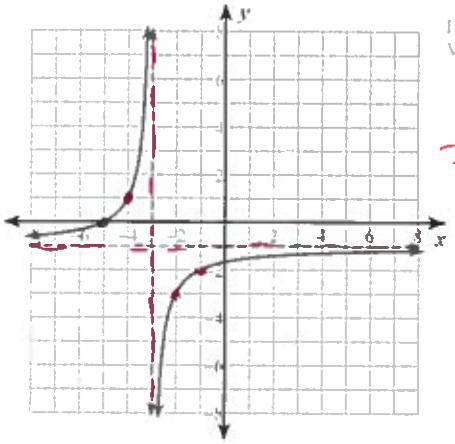


Discontinuities 2
Vertical Asym $x = 2$

$\frac{1}{1}$ $\frac{1}{1}$

$\sqrt{1}$

57) $f(x) = -\dfrac{2}{x+3} - 1$



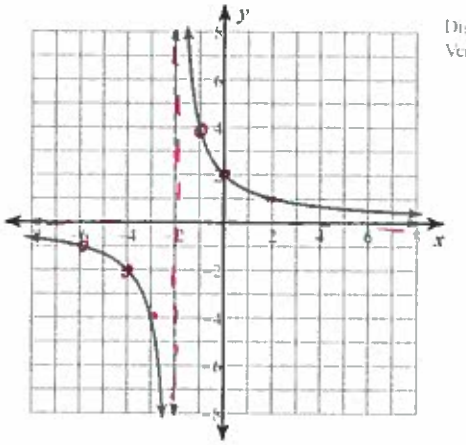
Discontinuities -3
Vertical Asym $x = -3$

$\frac{-2}{1}$ $\frac{-1}{2}$

$\sqrt{2}$

58) $f(x) = \dfrac{4}{x+2}$

(-2,0)



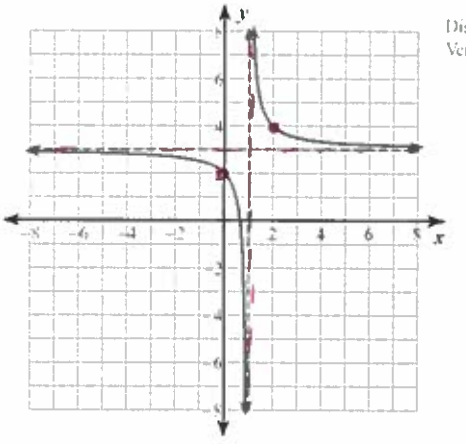
Discontinuities -2
Vertical Asym $x = -2$

$\frac{4}{1}$ $\frac{1}{4}$

$\sqrt{4} = 2$ ✓

59) $f(x) = \dfrac{1}{x-1} + 3$

(1,3)



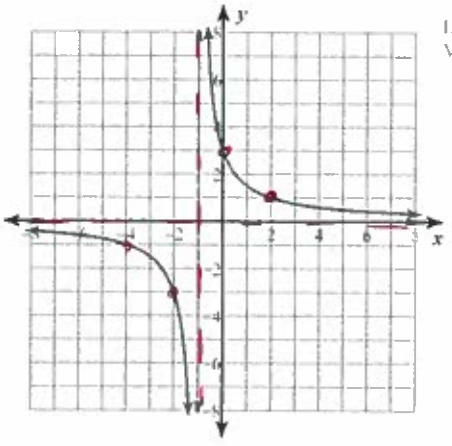
Discontinuities 1
Vertical Asym $x = 1$

$\frac{1}{1}$ $\frac{1}{1}$

$\sqrt{1}$ ✓

60) $f(x) = \dfrac{3}{x+1}$

(-1,0)



Discontinuities -1
Vertical Asym $x = -1$

$\frac{3}{1}$ $\frac{1}{3}$ $\sqrt{3}$

Graphing Rational Functions with Holes

For each function, find the holes, vertical asymptotes, horizontal asymptotes, and domain. Use your calculator or Desmos to help you graph the equation.

EATS SAME

$\frac{1}{1} = 1$

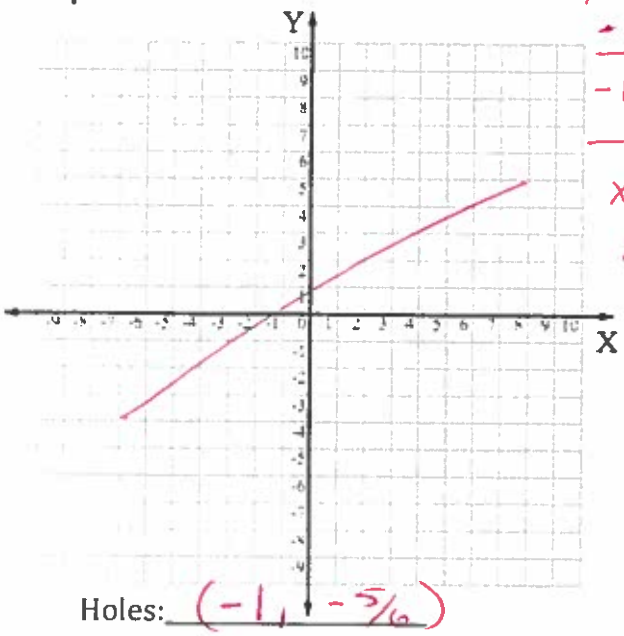
$\frac{x^2+7x+6}{x^2-4x-5} = \frac{(x+6)(x+1)}{(x+1)(x-5)}$

Hole:

$\frac{-1+6}{-1-5} = \frac{5}{-6}$

$x-5=0$

$x=5$



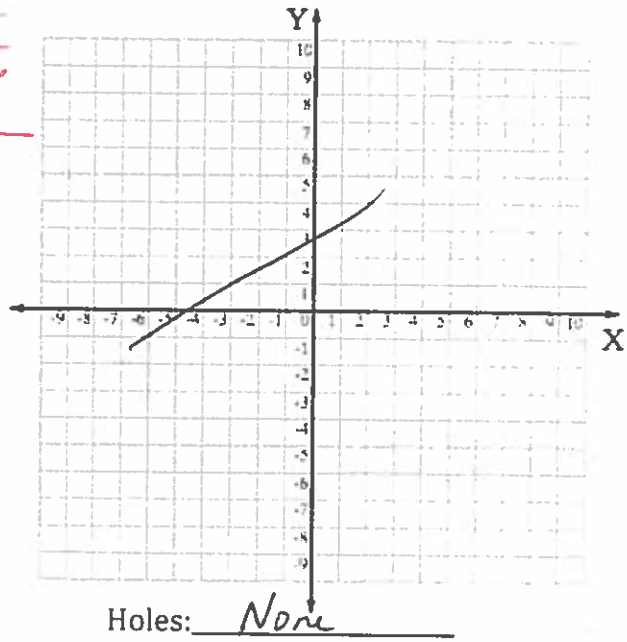
Holes: $(-1, -5/6)$

VA: $x=5$

HA: $y=1$

Domain: $(-\infty,-1) \cup (-1,5) \cup (5,\infty)$

$\frac{x^2+4x-12}{x^2-5x+6} = \frac{(x+6)(x+2)}{(x+6)(x+1)}$



Holes: None

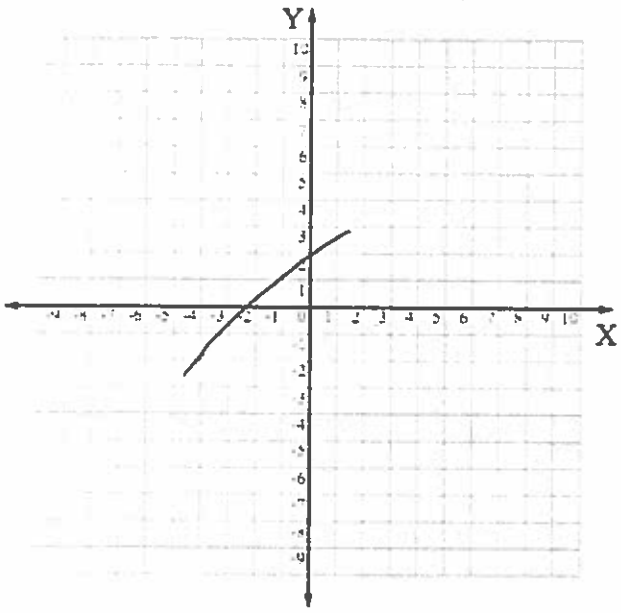
VA: $x=6,\ x=-1$

HA: $y=1$

Domain: $(-\infty,-1) \cup (-1,6) \cup (6,\infty)$

BoBo

$\frac{2x+6}{x^2+7x+12} = \frac{2(x+3)}{(x+3)(x+4)}$



$x+4=0$

$x=-4$

$\frac{2}{-3+4} = \frac{2}{1} = 2$

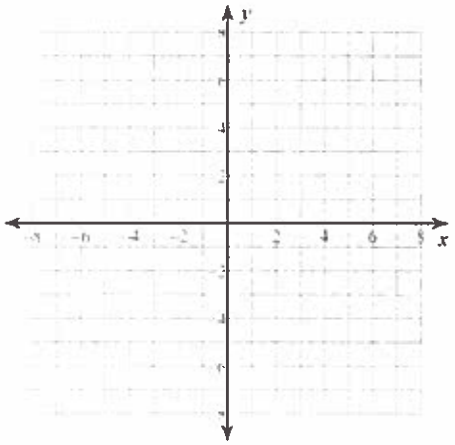
Holes: $(-3, 2)$

VA: $x=-4$

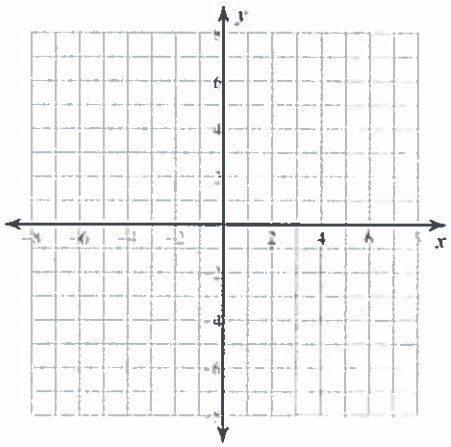
HA: $y=0$

Domain: $(-\infty,-4) \cup (-4,-3) \cup (-3,\infty)$

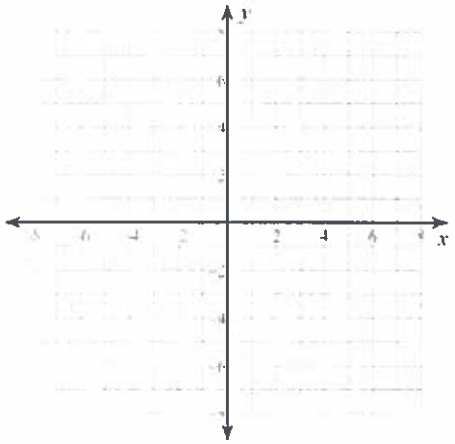
55) $f(x) = -\dfrac{2}{x-3}$



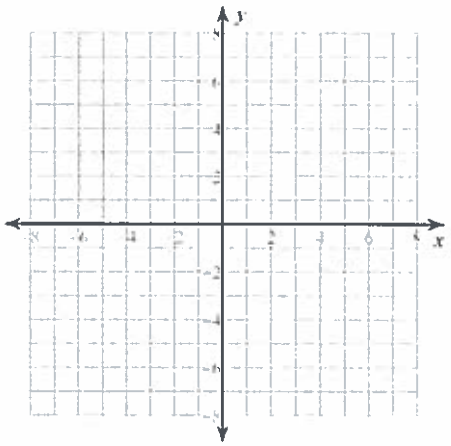
56) $f(x) = \dfrac{1}{x-2} - 2$



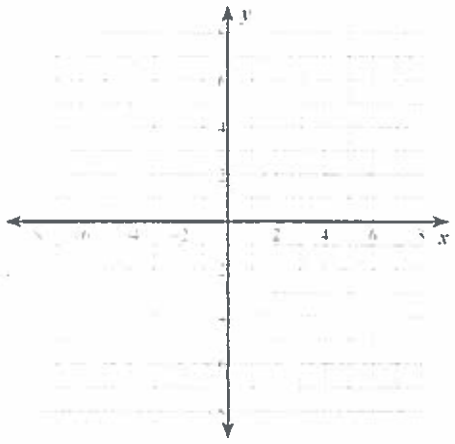
57) $f(x) = -\dfrac{2}{x+3} - 1$



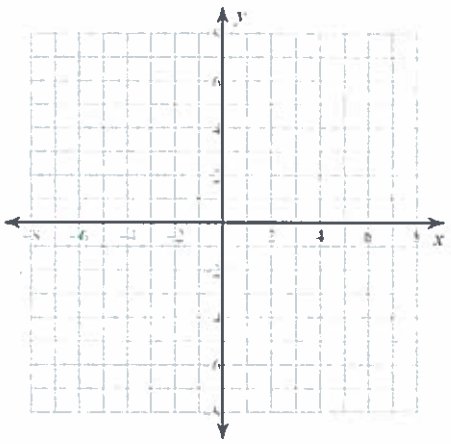
58) $f(x) = \dfrac{4}{x+2}$



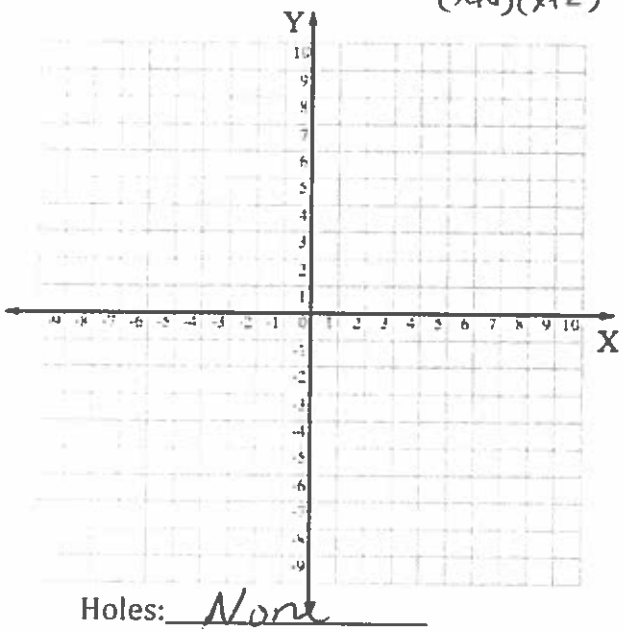
59) $f(x) = \dfrac{1}{x-1} + 3$



60) $f(x) = \dfrac{3}{x+1}$



EATS $\frac{1}{1} \cdot \frac{x^2-7x+12}{x^2+8x+12} \cdot \frac{(x-3)(x-4)}{(x+6)(x+2)}$



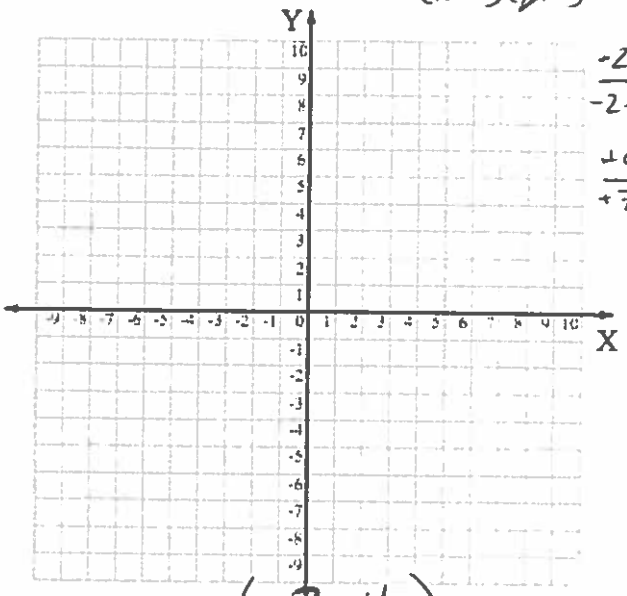
Holes: None

VA: $x=-6,\ x=-2$

HA: $y=1$

Domain: $(-\infty,-6)\cup(-6,-2)\cup(-2,\infty)$

EATS $\frac{x^2-4}{x^2-3x-10} \quad \frac{(x-2)(x+2)}{(x-5)(x+2)}$



$\frac{-2-2}{-2-5}$

$\frac{-4}{-7}$

Holes: $(-2, 4/7)$

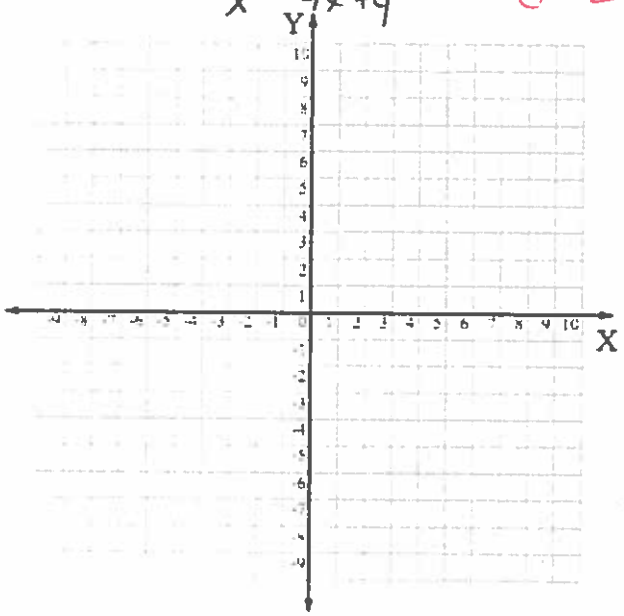
VA: $x=5$

HA: $y=1$

Domain: $(-\infty,-2)\cup(-2,5)\cup(5,\infty)$

$\frac{1}{2}$ $\quad -6 \quad -5 \quad -\frac{4}{2} \quad -\frac{3}{2}$

$\leftarrow \frac{2x^2-5x-3}{x^2-4x+4} = \frac{(2x-3)(2x+1)}{(x-2)(x-2)}$



EATS $\frac{2}{1}$

Holes: None

VA: $x=2$

HA: $y=2$

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