### A Characteristics of the Rational Function:

\[ f(x) = \frac{ax+b}{cx+d}, \quad a, c \neq 0 \]

**Case 1.** \( cx+d \) is not a factor of \( ax+b \)

<table>
<thead>
<tr>
<th>Domain: ( R \setminus {-d/c} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range: ( R \setminus {a/c} )</td>
</tr>
<tr>
<td>x-intercept: ( -b/a )</td>
</tr>
<tr>
<td>y-intercept: ( b/d ) if ( d \neq 0 )</td>
</tr>
<tr>
<td>Symmetry: neither even nor odd</td>
</tr>
<tr>
<td>Vertical asymptote: ( x = -d/c )</td>
</tr>
<tr>
<td>Horizontal asymptote: ( y = a/c )</td>
</tr>
<tr>
<td>Continuity: There exists an infinite break at ( x = -d/c )</td>
</tr>
</tbody>
</table>

### B Characteristics of the Rational Function:

\[ f(x) = \frac{ax+b}{cx+d}, \quad a, c \neq 0 \]

**Case 2.** \( cx+d \) is a factor of \( ax+b \)

<table>
<thead>
<tr>
<th>Domain: ( R \setminus {-d/c} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range: ( {a/c} )</td>
</tr>
<tr>
<td>x-intercept: none</td>
</tr>
<tr>
<td>y-intercept: ( b/d ) if ( d \neq 0 )</td>
</tr>
<tr>
<td>Symmetry: neither even nor odd</td>
</tr>
<tr>
<td>Vertical asymptote: none</td>
</tr>
<tr>
<td>Horizontal asymptote: ( y = a/c )</td>
</tr>
<tr>
<td>Continuity: There exists a hole at ( x = -d/c )</td>
</tr>
</tbody>
</table>

### Ex 1.
Find the characteristics of the function \( f(x) = \frac{2x-4}{x+2} \). Then graph it.

### Ex 2.
Find the characteristics of the function \( f(x) = \frac{3x+6}{2x+4} \). Then graph it.

### Ex 3.
Graph the function: \( f(x) = 2 - 1/x \).

### Ex 4.
Find a function of the form \( f(x) = \frac{ax+b}{cx+d} \) with a horizontal asymptote \( y = 2 \), a vertical asymptote \( x = 1 \) and an x-intercept \( x = 1 \). Then graph it.
Ex 5. Graph the function $f(x) = \frac{x}{(x+1)}$ and its reciprocal on the same grid.

Ex 6. Graph the function

$$f(x) = \frac{2x^2 + 7x + 6}{x^2 + x - 2}$$

Ex 7. Graph.

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

b) $f(x) = \frac{x}{x^2 + x - 6}$

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

d) $f(x) = \frac{x^2 - 9}{4-x^2}$

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

Ex 8. Graph.

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

**Reading:** Nelson Textbook, Pages 263-271

**Homework:** Nelson Textbook, Page 272: #1, 5c, 6ad, 9, 13, 14