Reduce:

\[ \frac{x^2 + 8x - 20}{x^2 + 11x + 10} = \frac{(x+10)(x-2)}{(x+10)(x+1)} \]

\[ = \frac{x-2}{x+1} \quad x \neq -10 \]

\[ \frac{x^2 - 9}{x^3 + x^2 - 9x - 9} = \frac{x^2 - 9}{x^2(x+1) - 9(x+1)} \]

\[ = \frac{x^2 - 9}{(x+1)(x^2 - 9)} \]

\[ = \frac{1}{x+1} \quad x \neq \pm 3 \]
Perform the operations and simplify:

\[
\frac{4y-16}{5y+15} \cdot \frac{2y+6}{4-y} = \frac{4(y-4)(2)(y+3)}{5(y+3)(4-y)} = \frac{4(-1)(4-y)(2)}{5(4-y)} = -\frac{8}{5}
\]

\[
\frac{2}{x^2 - x - 2} + \frac{10}{x^2 + 2x - 8} = \frac{L.C.D.}{(x-2)(x+1)(x+4)}
\]

\[
\frac{2}{(x-2)(x+1)} \frac{(x+4)}{(x+4)} + \frac{10}{(x+4)(x-2)} \frac{(x+1)}{(x+1)}
\]

\[
= \frac{2x+8 + 10x+10}{(x-2)(x+1)(x+4)} = \frac{12x+18}{(x-2)(x+1)(x+4)}
\]

\[
= 6 \frac{2x+3}{(x-2)(x+1)(x+4)}
\]
\[
\frac{\left( \frac{x}{3} - \frac{1}{6} \right)}{\frac{1}{2x}} \cdot \frac{6x}{6x} = \frac{x\cdot6x = 2x^2}{2x} \quad \frac{-1\cdot6x = -x}{6} \quad \frac{1}{2x} \cdot \frac{6x}{3} = 3
\]
\[
\frac{2}{x+1} + \frac{2}{x-1} + \frac{1}{x^2-1} = \frac{2(x-1)}{(x+1)(x-1)} + \frac{2(x+1)}{(x-1)(x+1)} + \frac{1}{(x+1)(x-1)}
\]

\[
= \frac{2x-2 + 2x + 2 + 1}{(x+1)(x-1)} = \sqrt{\frac{4x+1}{(x+1)(x-1)}}
\]

\[
\text{LCM} = 4x
\]

\[
\left(\frac{x-4}{x}\right) \cdot \frac{4x}{4x} = \frac{(x-4)(4x)}{x^2-16}
\]

\[
\left(\frac{x-4}{x}\right) \cdot \frac{2}{4} = \frac{(x-4)(4x)}{(x-4)(x+4)}
\]

\[
\frac{x}{4} \cdot 4x = x^2
\]

\[
-\frac{4}{x} \cdot 4x = -16
\]
\[ 5x^5 - 3x^{-\frac{3}{2}} = \frac{5x^5}{x^{\frac{3}{2}}} - \frac{3}{x^{\frac{3}{2}}} = \frac{5x^{\frac{13}{2}} - 3}{x^{\frac{3}{2}}} \quad \text{LCD} = x^{\frac{3}{2}} \]

or \[ x^{\frac{3}{2}}(5x - 3) \]

\[ 2x(x - 5)^{-3} - 4x^2(x - 5)^{-4} \quad \text{LCD} = (x-5)^4 \]

\[ = \frac{2x}{(x-5)^3} \cdot \frac{(x-5)}{(x-5)^4} - \frac{4x^2}{(x-5)^4} \]

\[ = \frac{2x(x-5) - 4x^2}{(x-5)^4} = \frac{2x^2 - 10x - 4x^2}{(x-5)^4} \]

\[ = -2x^2 - 10x \quad \text{or} \quad -2x^2 - 10x \quad \text{or} \quad -2x(x+5)(x-5)^4 \]
P.5 The Cartesian Plane
(Rectangular Coordinate System)

Identify: origin, x-axis, y-axis, quadrants

\((x,y)\) is called an ordered pair. In the ordered pair \((2, 5)\),
2 is called the first or \textit{x-coordinate} and 5 is called the
second or \textit{y-coordinate}.

\((2,5)\) is not the same as \((5,2)\)
Examples:
Plot the following points on the Cartesian plane: (2, 5), (-2,5), (-2,-5), (2,-5),(2,0),(0,-5).
Page 55 #22. The table shows the number $y$ of Wal-Mart stores for each year $x$ from 1994 through 2001. Sketch a scatter plot of the data.

<table>
<thead>
<tr>
<th>Year, $x$</th>
<th>Number of stores, $y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>2759</td>
</tr>
<tr>
<td>1995</td>
<td>2943</td>
</tr>
<tr>
<td>1996</td>
<td>3054</td>
</tr>
<tr>
<td>1997</td>
<td>3406</td>
</tr>
<tr>
<td>1998</td>
<td>3599</td>
</tr>
<tr>
<td>1999</td>
<td>3985</td>
</tr>
<tr>
<td>2000</td>
<td>4189</td>
</tr>
<tr>
<td>2001</td>
<td>4414</td>
</tr>
</tbody>
</table>
Given two points in the coordinate plane: \((x_1, y_1), (x_2, y_2)\)

The distance \(d\) between the two points is

\[
d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.
\]

The midpoint of the line segment joining the two points is

\[
\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\overline{x}, \overline{y}\right)
\]

Examples: Find the distance between the points and the midpoint of the line segment joining them.

\((1,12)\) and \((6,0)\)

\[
d = \sqrt{(6-1)^2 + (0-12)^2}
\]

\[
= \sqrt{5^2 + (-12)^2} = \sqrt{25 + 144}
\]

\[
= \sqrt{169} = 13
\]

\[
\left(\overline{x}, \overline{y}\right) = \left(\frac{1+6}{2}, \frac{12+0}{2}\right) = \left(\frac{7}{2}, 6\right)
\]
(-7, -4) and (2, 8)

\[
d = \sqrt{(2 - (-7))^2 + (8 - (-4))^2}
\]

\[
= \sqrt{9^2 + 12^2} = \sqrt{81 + 144}
\]

\[
= \sqrt{225} = 15
\]

\[
(x, y) = \left(\frac{-7 + 2}{2}, \frac{-4 + 8}{2}\right) = \left(-\frac{5}{2}, 2\right)
\]
Standard form of the equation of a circle:

\[(x - h)^2 + (y - k)^2 = r^2\]

where \((h,k)\) is the center of the circle and \(r\) is its radius.

Examples: Find the equation of the circle with given center and radius.

Center: \((0,0)\) and radius = 5

\[(x - 0)^2 + (y - 0)^2 = 5^2\]
\[x^2 + y^2 = 25\]

Center: \((0, 1/3)\) and radius = 1/3.

\[(x - 0)^2 + (y - \frac{1}{3})^2 = \left(\frac{1}{3}\right)^2\]
\[x^2 + \left(y - \frac{1}{3}\right)^2 = \frac{1}{9}\]
example. Circle with center \((2, -3)\) and radius 4.

\[(x-h)^2 + (y-k)^2 = r^2\]

\[(x-2)^2 + (y-(-3))^2 = 4^2\]

\[(x-2)^2 + (y+3)^2 = 16\]