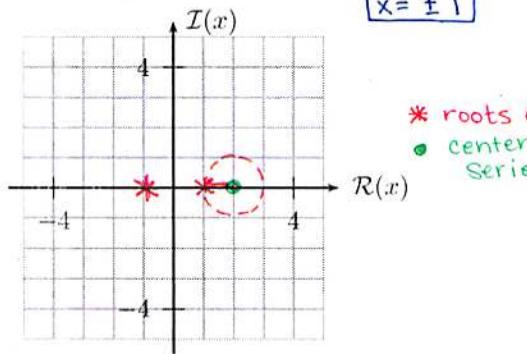


MATH 2340 RADIUS PRACTICE

Consider the following functions $f(x)$. Use complex variables to find the radius of convergence for the Taylor Series centered about the given x_0 . Then list the real values of x for which the series will converge.

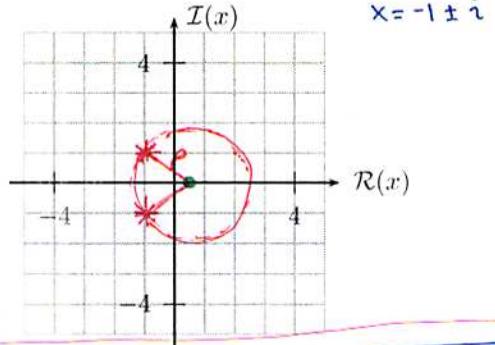
1. $f(x) = \frac{1}{x^2 - 1}$, where $x_0 = 2$
 roots of denominator



radius of convergence = 1
 $|x-2| < 1 \rightarrow -1 < x-2 < 1$

$1 < x < 3$
 series converges for these x values

2. $f(x) = \frac{x}{x^2 + 2x + 2}$, where $x_0 = \frac{1}{2}$
 roots of denom.



radius of convergence = $\sqrt{\left(\frac{3}{2}\right)^2 + (1)^2} = \frac{\sqrt{13}}{2}$

$$= \sqrt{\frac{9}{4} + \frac{4}{4}}$$

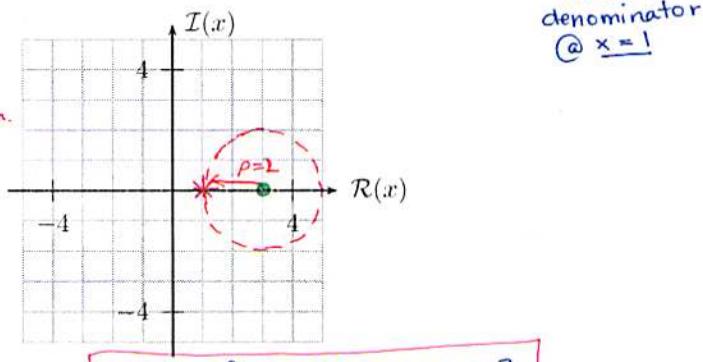
$$\rho = \frac{\sqrt{13}}{2}$$

$$|x - \frac{1}{2}| < \frac{\sqrt{13}}{2} \rightarrow -\frac{\sqrt{13}}{2} < x - \frac{1}{2} < \frac{\sqrt{13}}{2}$$

Series converges for these x .

$$\frac{1-\sqrt{13}}{2} < x < \frac{1+\sqrt{13}}{2}$$

3. $f(x) = \frac{x}{x^2 - x}$, where $x_0 = 3$
 simplify $f(x) = \frac{1}{x-1}$
 roots of denominator @ $x = 1$

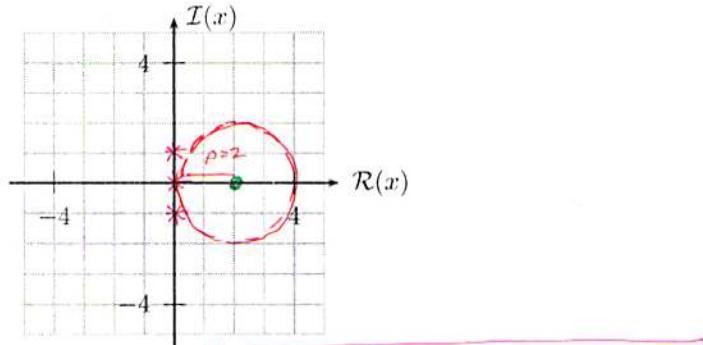


radius of convergence = 2

$$|x-3| < 2 \rightarrow -2 < x-3 < 2$$

$1 < x < 5$
 series converges for these x values.

4. $f(x) = \frac{7x-1}{x^3+x}$, where $x_0 = 2$
 $x(x^2+1) = 0 \quad x=0, x=\pm i$



radius of convergence = 2

$$|x-2| < 2 \rightarrow 0 < x < 4$$

converges for these x -values.