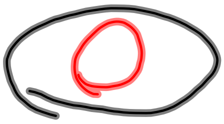
§3.4 Due Thursday

#s 9-35, 45, 47, 49, 51, 53, 55

↳ Just do graph. That other stuff will show up on a complete, properly-labeled graph.



$$\lim_{x\to-\infty}\left(\sqrt{x^2+x+1}+x\right) = \infty-\infty = ?$$

$$\frac{\sqrt{x^2+x+1}+x}{1}\cdot\frac{\sqrt{x^2+x+1}-x}{\sqrt{x^2+x+1}-x}$$

$$= \frac{x^2+x+1-x^2}{\sqrt{x^2+x+1}-x} = \frac{x+1}{\sqrt{x^2+x+1}-x} = \frac{x+1}{\sqrt{x^2}\sqrt{1+\frac{1}{x}+\frac{1}{x^2}}-x}$$

$$= \frac{x+1}{|x|\sqrt{1+\frac{1}{x}+\frac{1}{x^2}}-x} = \frac{x\left(1+\frac{1}{x}\right)}{-x\sqrt{1+\frac{1}{x}+\frac{1}{x^2}}-x}$$

$$= \frac{x\left(1+\frac{1}{x}\right)}{-x\left(\sqrt{1+\frac{1}{x}+\frac{1}{x^2}}+1\right)} = \frac{1+\frac{1}{x}}{-\left(\sqrt{1+\frac{1}{x}+\frac{1}{x^2}}+1\right)}$$

$$\xrightarrow{x\to-\infty} \frac{1+0}{-\left(\sqrt{1+0+0}+1\right)} = \frac{1}{-(1+1)} = -\frac{1}{2}$$

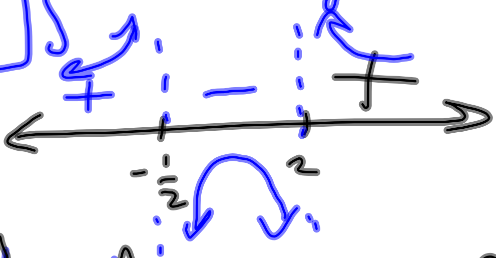
College Algebra Approach to graphing

(34) $f(x)=\dfrac{x^2+1}{2x^2-3x-2}$ $x\to\infty$ $\boxed{\frac{1}{2}=y}$ H.A.

$\mathcal{D}=\{x \mid 2x^2-3x-2\neq 0\}=\{x \mid x\neq -\frac{1}{2}, 2\}$
$(2x+1)(x-2)$

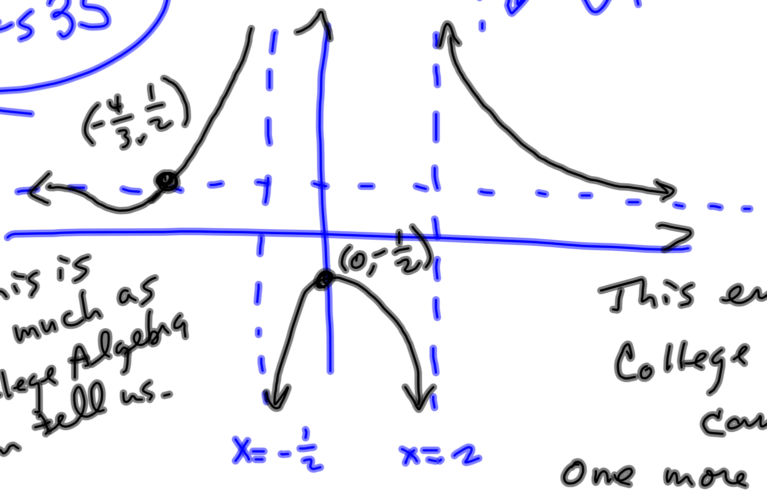
Nothing cancels with numerator.

$\boxed{\begin{array}{l} x=-\frac{1}{2} \\ x=2 \end{array}}$ Vertical Asymptotes



#s 35

$f(0)=-\frac{1}{2}$



This is as much as college Algebra can tell us.

This ends what College Algebra can do (mostly).

One more thing to check: Does f(x) cross its horizontal asymptote?

$$\frac{x^2+1}{2x^2-3x-2}=\frac{1}{2}$$

$$2x^2+2=2x^2-3x-2$$

$$2=-3x-2$$

$$3x=-4$$

$$x=-\frac{4}{3}$$

#s 44-47 want you to go the whole nine yds.
So, I'll continue # 34 in this spirit.

$$f(x)=\frac{x^2+1}{2x^2-3x-2} \Longrightarrow f'(x)=\frac{(3x-1)(x+3)}{(2x^2-3x-2)^2}$$

$$\frac{2x(2x^2-3x-2)-(x^2+1)(4x-3)}{(\quad)^2} = \frac{4x^3-6x^2-4x-(4x^3-3x^2+4x-3)}{(\quad)^2}$$

$$= \frac{4x^3-6x^2-4x-4x^3+3x^2-4x+3}{(\quad)^2} = \frac{-3x^2-8x+3}{(\quad)^2}$$

$$= \frac{-(3x^2+8x-3)}{(\quad)} = \frac{-(3x-1)(x+3)}{\left((2x+1)(x-2)\right)^2}$$

$$f''(x) = \frac{2\left(6x^3+24x^2-18x+17\right)}{\left(2x^2-3x-2\right)^3} \quad \text{SET } 0 \Longrightarrow$$

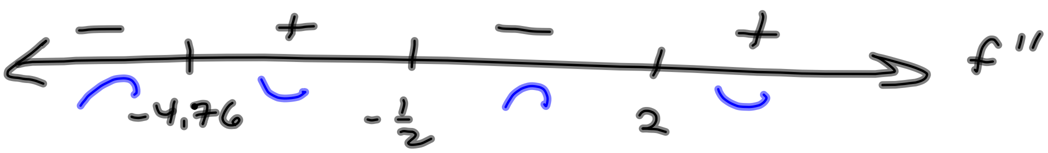
ve $\{-4.756035960,\ 0.378017980-0.6729313630\,I,\ 0.378017980+0.6729313630\,I\}$

$(x+4.756)^1 \cdot$
$(x-(.378-.673i))$

Take the real one

$f(-4.756035960) \approx$ 0.4107243152

is our inflection point.



Test values can get you this if you don't like my hand-wave on how this factors & $(x+4.76)^1$ is the factor.

So the calculus-ified problem has

<u>THIS</u> graph: