12.3 Find Asymptotes of Graphs TEKS *a.5, A.1.D; 2A.10.A*
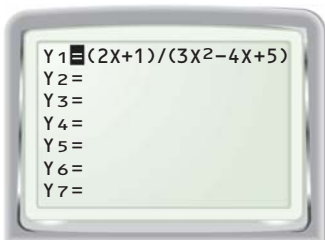
QUESTION How can you find the asymptotes of the graph of a rational function?

EXAMPLE 1 Graph a rational function

Graph $y = \dfrac{2x + 1}{3x^2 - 4x + 5}$ using a graphing calculator. Identify any vertical or horizontal asymptotes.
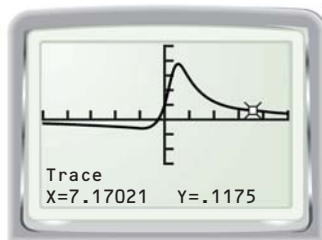
STEP 1 Enter function
Press [Y=] and enter the function as shown.

STEP 2 Identify asymptotes
Graph the function. Use the *trace* feature to identify the asymptotes.

```
Y1▪(2X+1)/(3X²−4X+5)
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
```

```
Trace
X=7.17021    Y=.1175
```

The graph doesn't approach a vertical line. So, the graph doesn't have a vertical asymptote. The graph approaches the *x*-axis. So, $y = 0$ is a horizontal asymptote.

PRACTICE

Graph the function using a graphing calculator. Identify any vertical or horizontal asymptotes.

1. $y = \dfrac{8}{x - 2}$

2. $y = \dfrac{4}{6x - 7}$

3. $y = \dfrac{x - 9}{x^2 + 1}$

4. $y = \dfrac{x + 5}{x^2 + 4x + 4}$

5. $y = \dfrac{x + 1}{4x^2 - 36}$

6. $y = \dfrac{5}{10x^2 + 9}$

7. Make a table that shows the following information for each function in Exercises 1–6:
   - vertical asymptotes, if any
   - values, if any, of *x* that make the function undefined
   - horizontal asymptotes, if any
   - degree of numerator
   - degree of denominator