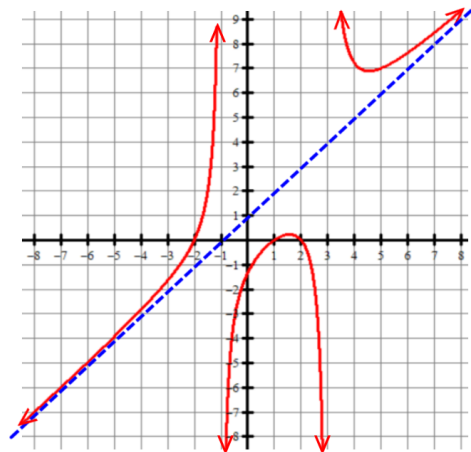**1.11B Notes**

Slant Asymptotes

Degree of the numerator is one higher than degree of denominator!

Example #1

$$f(x) = \frac{x^3 - x^2 - 4x + 4}{x^2 - 2x - 3}$$

Example #2

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

Long Division

Synthetic Division

Write the equation of the slant asymptote.

Example 3:

$$f(x) = \frac{4x^2 + 2x - 7}{2x + 3}$$

Example 4:

$$g(x) = \frac{6x^3 + 13x^2 - 5}{2x^2 + 3x}$$

End Behavior

$$g(x) = \frac{6x^3 + 13x^2 - 5}{2x^2 + 3x}$$

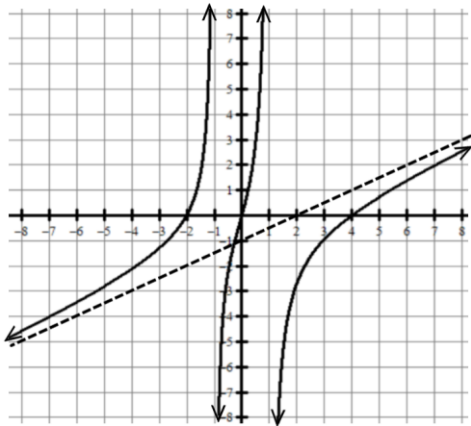# 1.11B Polynomial Long Division and Slant Asymptotes

AP Precalculus

Divide the following using long division or synthetic division.
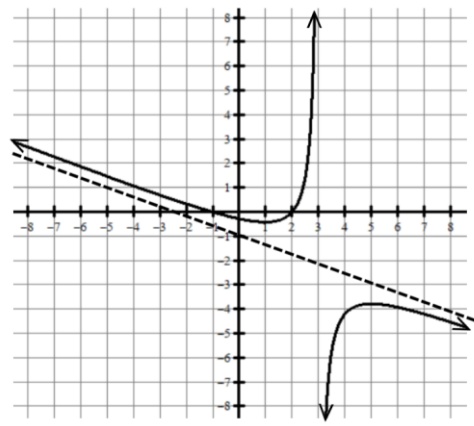
1. $\dfrac{3x^3-4x^2-3}{x^2+5x+1}$

2. $\dfrac{x^3-4x^2+6x-4}{x-2}$

Use the graph of f to write the equation of the slant asymptote.

3.

4.

Determine if the following functions have a horizontal asymptote, slant asymptote, or neither.

5. $f(x)=\dfrac{4x^5-3x^3+4x+1}{5x^3-2x^2+1}$

Circle one:

The graph of f has a horizontal asymptote.

The graph of f has a slant asymptote.

The graph of f does not have a horziontal or slant asymptote.

6. $f(x)=\dfrac{2x^4+x^2+1}{3x^4-2x^2+5x}$

Circle one:

The graph of f has a horizontal asymptote.

The graph of f has a slant asymptote.

The graph of f does not have a horziontal or slant asymptote.

7. $f(x)=\dfrac{x^3+5x^2+x+2}{3x^4-2x^3+2x^2-3}$

Circle one:

The graph of f has a horizontal asymptote.

The graph of f has a slant asymptote.

The graph of f does not have a horziontal or slant asymptote.

Write the equation for the slant asymptote for the following functions.

8. $f(x) = \dfrac{x^3 - 2x^2 - 4x + 1}{x^2 - 2x + 1}$

9. $f(x) = \dfrac{x^2 - 9x + 4}{x + 6}$

10. $f(x) = \dfrac{4x^2 + 12x - 6}{2x + 1}$

11. $f(x) = \dfrac{9x^4 - 5x^2 + 3x - 6}{3x^3 - 4x^2}$

Use the rational function to answer the following.

12.

$$f(x) = \frac{3x^3 - 12x}{x^2 - 2x - 8}$$

a. Domain:

b. Zero(s):

c. Hole(s):

d. Vertical Asymptote(s):

e. Horizontal Asymptote:

f. Slant Asymptote:

g. y-intercept:

h. x-intercept(s):

i. End Behavior:

Multiple Choice

13. The function f is a rational function. The quotient and remainder form of f is given by $f(x) = -2x + 1 + \frac{3x+4}{x^2-4x-12}$. Which describes the end behavior of f?

(A) $\lim\limits_{x \to -\infty} f(x) = -\infty$ and $\lim\limits_{x \to \infty} f(x) = -\infty$

(B) $\lim\limits_{x \to -\infty} f(x) = \infty$ and $\lim\limits_{x \to \infty} f(x) = \infty$

(C) $\lim\limits_{x \to -\infty} f(x) = -\infty$ and $\lim\limits_{x \to \infty} f(x) = \infty$

(D) $\lim\limits_{x \to -\infty} f(x) = \infty$ and $\lim\limits_{x \to \infty} f(x) = -\infty$

14. Which of the following is equivalent to $\frac{x^2+5x+2}{x+5}$?

(A) $x + 1$

(B) $x + 2$

(C) $x + \frac{2}{x+5}$

(D) $x + 1 - \frac{4}{x+5}$

15. The function f is given by $f(x) = \frac{6x^2+ax+2}{x+3}$ and has a slant asymptote of $y = 6x + 3$. What is the value of a?

(A) -4

(B) 12

(C) 15

(D) 21