1.11B Polynomial Long Division and Slant Asymptotes

AP Precalculus

1.11B Practice

Divide the following using long division or synthetic division.

1. $\frac{3x^3-4x^2-3}{x^2+5x+1}$

$3x - 19$

$x^2+5x+1 \overline{)\,3x^3-4x^2+0x-3}$

$-(3x^3+15x^2+3x)$

$-19x^2-3x-3$

$-(-19x^2-95x-19)$

$92x+16$

$3x-19+\frac{92x+16}{x^2+5x+1}$

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

2	1	-4	6	-4
		2	-4	4
	1	-2	2	0

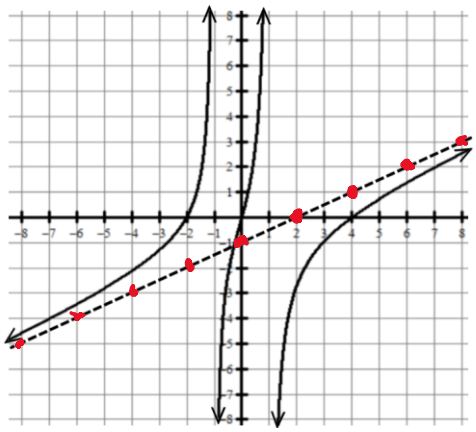
Remainder

$1x^2-2x+2+\frac{0}{x-2}$

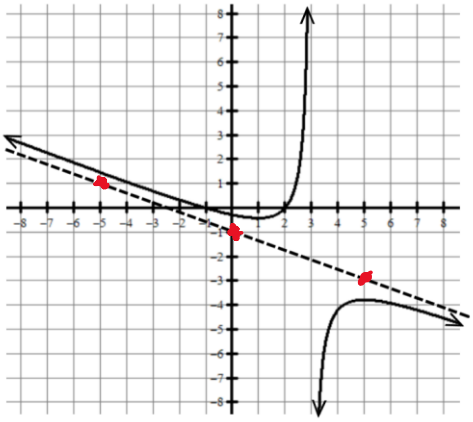
x^2-2x+2

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

3. $y=\frac{1}{2}x-1$



4. $y=-\frac{2}{5}x-1$



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

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

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

Circle one: $y=\frac{2}{3}$

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

Circle one: $y=0$

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

x

$x^2-2x+1 \overline{)\, x^3-2x^2-4x+1}$

$-(x^3-2x^2+1x)$

$-5x+1$

$y=x$

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

$-6 \mid 1 \quad -9 \quad 4$

$\quad\quad -6 \quad 90$

$\quad 1 \quad -15 \quad 94$

$y=x-15$

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

must divide numerator by 2

$4 \quad 12 \quad -6$

$-\frac{1}{2} \mid 2 \quad 6 \quad -3$

$\quad\quad -1 \quad -2.5$

$\quad 2 \quad 5 \quad -5.5$

$y=2x+5$

Note: If you needed the remainder, it would be $-5.5(2)=-11$

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

$3x+4$

$3x^3-4x^2 \overline{)\, 9x^4+0x^3-5x^2+3x-6}$

$-(9x^4-12x^3)$

$12x^3-5x^2$

$-(12x^3-16x^2)$

$11x^2+3x-6$

$y=3x+4$

Use the rational function to answer the following.

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

$3x(x+2)(x-2)$

$(x-4)(x+2)$

a. Domain: $(-\infty,-2)\cup(-2,4)\cup(4,\infty)$

b. Zero(s): $x=0$ and 2

c. Hole(s): $x=-2$

d. Vertical Asymptote(s): $x=4$

e. Horizontal Asymptote: none

f. Slant Asymptote: $y=3x+6$

$3x+6$

$x^2-2x-8 \overline{)\, 3x^3+0x^2-12x}$

$-(3x^3-6x^2-24x)$

$6x^2+12x$

$-(6x^2-12x-8)$

$24x+8$

g. y-intercept: $\frac{0}{-8}=0$

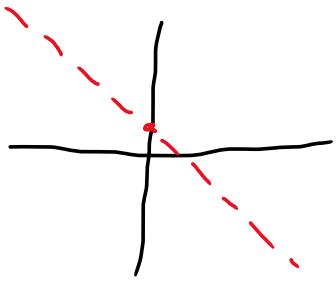
h. x-intercept(s): $x=0$ and 2

i. End Behavior: $\lim_{x\to-\infty} f(x)=-\infty$ $\lim_{x\to\infty} f(x)=\infty$

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?

slant asymptote



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

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

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

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

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

$-5 \mid 1 \quad 5 \quad 2$

$\quad\quad -5 \quad 0$

$1 \quad 0 \quad 2$

$1x + 0 + \frac{2}{x+5}$

(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?

$-3 \mid 6 \quad a \quad 2$

$\quad\quad -18$

$6 \quad 3$

(A) -4

(B) 12

(C) 15

(D) 21

$a = 21$