

Zeros and Long Division (1.8+1.11) HW

Match each of the numbered descriptions below with the corresponding lettered equation to the right. Use each description and each equation exactly once. There are no repeats.

1. $f(x)$ has one vertical asymptote, one zero, and one hole.

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

2. $f(x)$ has two vertical asymptotes, one zero, and no holes.

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

3. $f(x)$ has two vertical asymptotes, no zero, and no holes.

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

4. $f(x)$ has two vertical asymptotes, two zeros, and no holes.

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

5. $f(x)$ has one vertical asymptote, no zeros, and no holes.

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

6. $f(x)$ has one vertical asymptote, no zeros, and one hole.

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

Identify the x -intercepts, vertical asymptotes, and holes for each of the following functions.

$$7. y = \frac{x^2-8x+7}{(x^2-1)(x+2)}$$

$$8. y = \frac{2x^2+7x-4}{x^2-4x+4}$$

$$9. y = \frac{x^2+2x-3}{x^2+6x+9}$$

$$10. y = \frac{x^2+6x+9}{x^2+2x-3}$$

$$11. y = \frac{9x^2-1}{x^2-8x+20}$$

$$12. y = \frac{3x^2+4x-4}{x^2+7x+10}$$

All the following rational functions have a slant asymptote. Find the equation of the slant asymptote.

$$13. y = \frac{x^2-5x+2}{x-2}$$

$$14. y = \frac{x^3-5x}{x^2+2x+3}$$

$$15. y = \frac{x^2+1}{2x-2}$$

For each of the following rational functions, perform long division to rewrite the expression in an equivalent form. Also, find the equation of the horizontal or slant asymptote.

$$16. y = \frac{x-6}{x-2}$$

$$17. y = \frac{8x^3-x^2-2x+40}{x^3+4}$$

$$18. y = \frac{3x^2+10x-2}{x^2+1}$$

$$19. y = \frac{2x^2+7x+6}{x+3}$$

Zeros and Long Division (1.8+1.11) HW Answers

1. E
2. B
3. C
4. A
5. F
6. D
7. x -intercept: $(7,0)$ Vertical Asymptote: $x = -2$ and $x = -1$ Hole: $(1, -1)$
8. x -intercept: $(\frac{1}{2}, 0)$ and $(-4,0)$ Vertical Asymptote: $x = 2$ Hole: None
9. x -intercept: $(1,0)$ Vertical Asymptote: $x = -3$ Hole: None
10. x -intercept: None Vertical Asymptote: $x = 1$ Hole: $(-3,0)$
11. x -intercept: $(-\frac{1}{3}, 0)$ and $(\frac{1}{3}, 0)$ Vertical Asymptote: None Hole: None
12. x -intercept: $(\frac{2}{3}, 0)$ Vertical Asymptote: $x = -5$ Hole: $(-2, -\frac{8}{3})$
13. $y = x - 3$
14. $y = x - 2$
15. $y = \frac{1}{2}x + \frac{1}{2}$
16. The equation is equivalent to $y = 1 + \frac{-4}{x-2}$. This is also equivalent to $y = 1 - \frac{4}{x-2}$
Horizontal Asymptote: $y = 1$
17. The equation is equivalent to $y = 8 + \frac{-x^2-2x+8}{x^3+4}$. This is also equivalent to $y = 8 - \frac{x^2+2x-8}{x^3+4}$
Horizontal Asymptote: $y = 8$
18. This equation is equivalent to $y = 3 + \frac{10x-5}{x^2+1}$
Horizontal Asymptote: $y = 3$
19. This equation is equivalent to $y = 2x + 1 + \frac{3}{x+3}$
Slant Asymptote: $y = 2x + 1$