Algebra: Horizontal and Vertical Asymptotes

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Name: _____ Date: _____ Score: _____

DIRECTIONS *Find the horizontal asymptote (HA) and vertical asymptote(s) (VA) of each rational function.*

1 Find VA and HA:

$f(x) = 1/(x-3)$

Answer: _____

2 Find VA and HA:

$f(x) = 2/(x+5)$

Answer: _____

3 Find VA and HA:

$f(x) = (x+1)/(x-2)$

Answer: _____

4 Find VA and HA:

$f(x) = 3x/(x+4)$

Answer: _____

5 Find VA and HA:

$f(x) = x^2/(x^2-1)$

Answer: _____

6 Find VA and HA:

$f(x) = 5/(x^2-4)$

Answer: _____

7 Find VA and HA:

$f(x) = (2x+1)/(x-1)$

Answer: _____

8 Find VA and HA:

$f(x) = x^2/(x-1)$

Answer: _____

9 Find VA and HA:

$f(x) = (x-3)/(x^2-9)$

Answer: _____

10 Find VA and HA:

$f(x) = (3x^2+1)/(x^2+2)$

Answer: _____

Answer Key & Solutions

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TEACHER NOTES *VA: set denominator = 0. HA: compare degrees — if deg(num)<deg(den): y=0; equal: ratio of leading coefficients; num>den: none (oblique).*

1 1/(x-3)

= VA: x=3, HA: y=0

VA: x-3=0→x=3. Deg num<den→HA y=0

2 2/(x+5)

= VA: x=-5, HA: y=0

VA: x+5=0→x=-5. HA: y=0

3 (x+1)/(x-2)

= VA: x=2, HA: y=1

VA: x=2. Equal degrees: 1/1=1, HA: y=1

4 3x/(x+4)

= VA: x=-4, HA: y=3

VA: x=-4. Equal degrees: 3/1=3, HA: y=3

5 x^2/(x^2-1)

= VA: x=±1, HA: y=1

VA: x^2-1=0→x=±1. Equal deg: 1/1=1

6 5/(x^2-4)

= VA: x=±2, HA: y=0

VA: (x-2)(x+2)=0→x=±2. Deg<den→y=0

7 (2x+1)/(x-1)

= VA: x=1, HA: y=2

VA: x=1. Equal degrees: 2/1=2, HA: y=2

8 x^2/(x-1)

= VA: x=1, HA: none

VA: x=1. Num degree > den → no HA (oblique)

9 (x-3)/(x^2-9)

= VA: x=-3, HA: y=0

Factor: 1/(x+3); VA: x=-3 (hole at x=3). HA: y=0

10 (3x^2+1)/(x^2+2)

= VA: none, HA: y=3

Den: x^2+2 never 0 → no VA. Equal deg: 3/1=3