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Assessment of Learning: Unit 2 – Rational Functions – DAY 1

Instructions: Answer all questions in the space provided and **show all necessary steps**. Leave answers **exact** unless otherwise specified. The use of cellphones, audio or video recording devices, digital music players or email or text-messaging devices during the assessment is prohibited.

Knowledge & Understanding	Thinking	Communication
$17\frac{1}{2}$ /18	$4\frac{1}{2}$ /5	5 /5

KNOWLEDGE & UNDERSTANDING – [18 MARKS]

Multiple Choice: Write the **CAPITAL LETTER** corresponding to the correct answer on the line provided.
[1 Mark Each – 4 marks Total]

1. What is the maximum value of the function $f(x) = \dfrac{18}{x^2 - 9}$ over the interval $-3 < x < 3$? ____B____

   A) 0   B) -2 C) 2   D) $-\dfrac{1}{9}$

   (circled: 4)

2. Which of the following functions do not have a vertical asymptote? ____B____

   A. $f(x) = \dfrac{x-3}{x^2-9}$ B. $f(x) = \dfrac{x^2-4}{x-2}$ C. $f(x) = \dfrac{x+1}{(x-3)^2}$ D. $f(x) = -\dfrac{3x}{x^2}$

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

3. The horizontal asymptote of the function $f(x) = \dfrac{4x^2 - 3x + 2}{(-x+1)^2}$ is: ____C____

   A. $y = -4$ B. $y = 2$ Ⓒ. $y = 4$ D. $y = 4x^2 + 3x + 2$

4. Given $f(x) = \dfrac{-2(x+3)(x-12)}{(x+1)}$, which of the following statements is **true**? ____A____

   A. The y – intercept is at $(0, 72)$.
   B. The function has a horizontal asymptote at $y = 2$.
   C. There is a vertical asymptote at $x = 1$.
   D. The x – intercepts are at $x = 3$ and $x = -12$.

5. Consider the function $f(x) = \dfrac{(x^2 - x)(2x - 3)}{(x-4)(x+1)^2(x-1)}$ and determine the following. **[6 marks]**

Domain of the function	$x \in (-\infty, -1)(-1, 1)(1, 4), (4, \infty)$
Full coordinate of hole(s), if any.	hole @ $(1, \frac{1}{12})$ ✓
x-intercept(s), if any.	$x = (0, 0), (\frac{3}{2}, 0)$ ✓
y-intercept, if any.	$y = (0, 0)$
Equation of vertical asymptote(s), if any.	VA @ $x = -1, 4$ ✓
Equation of horizontal asymptote, if any.	HA @ $y = 0$ ✓

6. Determine the equation of a family of rational functions, in factored form, that has the following properties: **[3 marks]**
   - zeros at 0 and 3
   - vertical asymptotes at $x = 1$ and $x = -1$.
   - As $x \to 1^-, f(x) \to -\infty$ and $x \to 1^+, f(x) \to -\infty$
   - As $x \to -1^-, f(x) \to -\infty$ and $x \to -1^+, f(x) \to \infty$

   (circled: $2\frac{1}{2}$)

   Equation: $\dfrac{kx(x-3)}{(x-1)^2(x+1)}$ ✓ → ∴ the equation in factored following is $\dfrac{x(x-3)}{(x-1)^2(x+1)}$

   $k = 1$ $k > 0$

   (circled: $12\frac{1}{2}$)