PreCalculus Acc '17-18
Dr. Quattrin
Rational Practice Test
CALCULATOR ALLOWED
Round to 3 decimal places.
Show all work.

Name: SOLUTION KEY

Score _____

1. Find the zeros and VAs of $y = \dfrac{4x^2 - 16x}{x^3 - 4x^2 + x - 4}$. Show the supporting algebraic work.

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

Zeros: $(0, 0)$

VAs: NONE

POE: $\left(4, \dfrac{16}{17}\right)$

2. Find the extreme points of $y = \dfrac{4x^2 - 16x}{x^3 - 4x^2 + x - 4}$. Show the derivative and algebra to support the critical values.

$$\frac{dy}{dx} = \frac{d}{dx}\left[\frac{4x}{x^2+1}\right] = \frac{(x^2+1)(4) - 4x(2x)}{(x^2+1)^2}$$

$$= \frac{4x^2 + 4 - 8x^2}{(x^2+1)^2}$$

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

i) $-4x^2 + 4 = 0$
   $x^2 = 1$
   $x = \pm 1$

   $(1, 2)$
   $(-1, -2)$

ii) $x^2 + 1 = 0 \rightarrow$ NEVER

iii) END POINTS $\rightarrow$ NONE GIVEN

3. Find the equations of the lines tangent to and normal to $y = \dfrac{2x^2 - x - 3}{3 + 2x - x^2}$ at $x = 0$?

Tangent: $y + 1 = \frac{1}{3}(x - 0)$

Normal: $y + 1) = 3(x - 0)$

$y(0) = -1$

$m_{TAN} = \frac{1}{3}$

$y \approx \dfrac{(2x - 3)(x + 1)}{-(x - 3)(x + 1)}$

$\approx \dfrac{2x - 3}{3 - x}$

$\dfrac{dy}{dx} = \dfrac{(3 - x)(2) - (2x - 3)(-1)}{(3 - x)^2}$

$= \dfrac{6 - 2x + 2x - 3}{(3 - x)^2}$

$= \dfrac{3}{(3 - x)^2}$

4. Find the zeros, VAs, POEs and HA of $y = \dfrac{16 - x^2}{x^2 - 25}$. Show the supporting algebraic work.

Zeros: $\left(\pm 4, 0\right)$

VAs: $x = \pm 5$

HA: $y = -1$

POE: NONE

$y = \dfrac{(4 - x)(4 + x)}{(x - 5)(x + 5)}$

5. Find the extreme points of $y = \dfrac{16-x^2}{x^2-25}$. Show the derivative and algebra to support the critical values.

$$\frac{dy}{dx} = \frac{(x^2-25)(-2x) - (16-x^2)(2x)}{(x^2-25)^2}$$

$$= \frac{-2x^3 + 50x + 2x^3 - 32x}{(x^2-25)^2}$$

$$= \frac{16x}{(x^2-25)^2}$$

i) $\dfrac{dy}{dx} = 0 \rightarrow 16x = 0 \rightarrow x = 0$ 　　　$\left(0, \dfrac{-16}{25}\right)$

ii) $\dfrac{dy}{dx}$ DNE $\rightarrow x^2 - 25 = 0 \rightarrow x = \pm 5$ BUT THESE ARE VAS

iii) ENDPOINTS : NONE GIVEN

$\therefore \left(0, \, {}^{16}/_{25}\right)$

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CALCULATOR NOT ALLOWED
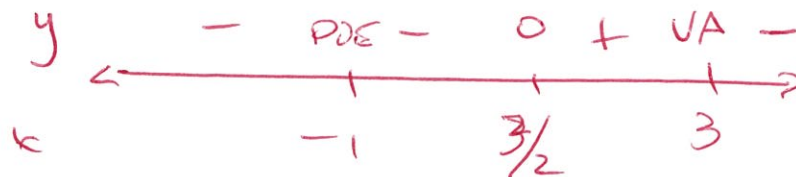Show all work.

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6. Write an equation of a rational function that has x–intercepts at $(-2, 0)$, VA at $x = 4$, a POE at $x = -3$, and a HA at $y = \frac{3}{7}$.

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

7. Show the sign pattern and solve $\dfrac{2x^2 - x - 3}{3 + 2x - x^2} \le 0$.

$$\frac{(2x-3)(x+1)}{-(x-3)(x+1)}$$

$$x \in (-\infty, -1) \cup (-1, \tfrac{3}{2}] \cup (3, \infty)$$

8. Find the traits and **sketch** $y = \dfrac{16 - x^2}{x^2 - 25}$.

Domain: $x \neq \pm 5$

Range: $y \in (-\infty, -1) \cup \left[\dfrac{-16}{25}, \infty \right)$

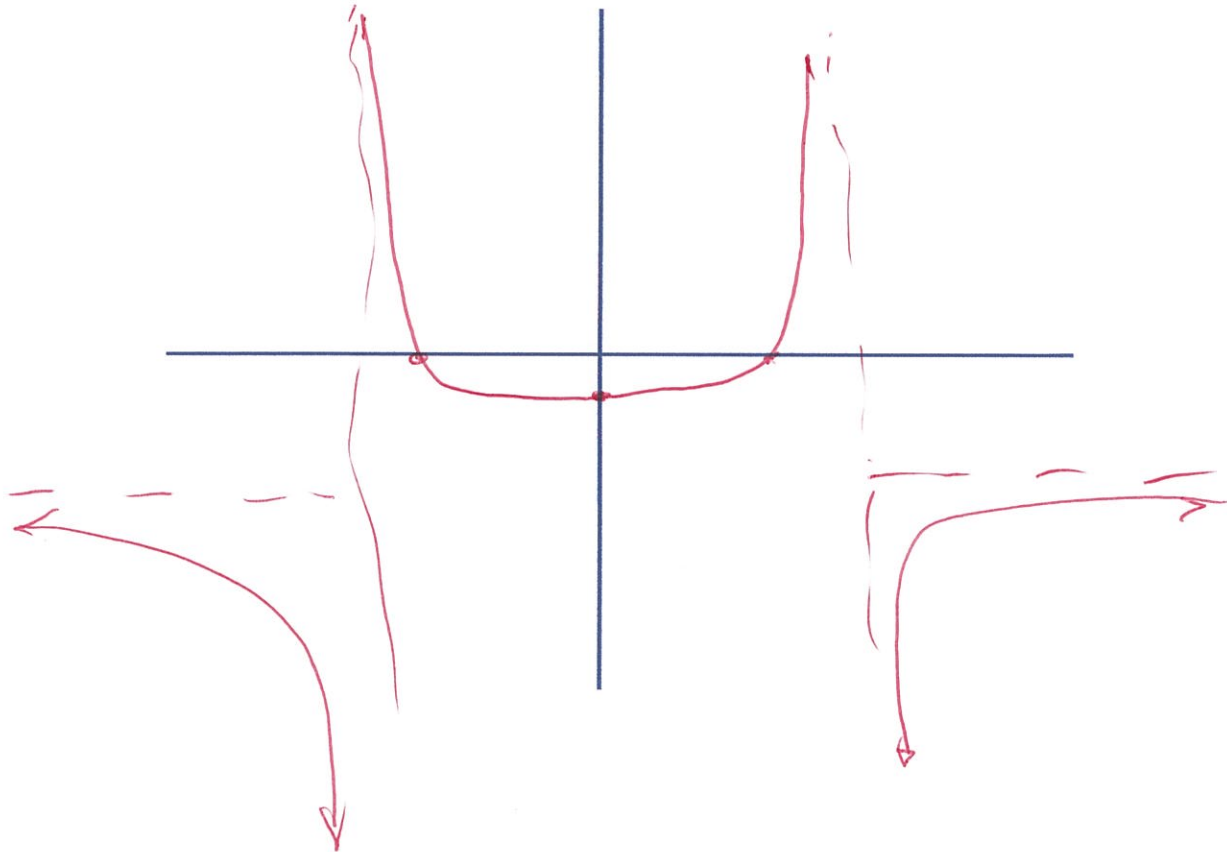Y – Intercept: $\left(0, \dfrac{-16}{25} \right)$

End Behavior: $y = -1$

Zeros: $(\pm 4, 0)$

Extreme Points: $\left(0, -16/25 \right)$

VAs: $x = \pm 5$

POE: NONE

9. Find the traits and **sketch** of $y = \dfrac{4x^2 - 16x}{x^3 - 4x^2 + x - 4}$.

Domain: $x \neq 4$

Zeros: $(0, 0)$

VAs: NONE

POEs: $\left(4, \dfrac{16}{17}\right)$

Y – Intercept: $(0, 0)$

Range: $y \in \left[-2, \dfrac{16}{17}\right) \cup \left(\dfrac{16}{17}, 2\right]$

End Behavior: $y = 0$

Extreme Points: $(1, 2) \ (-1, -2)$