PreCalculus Acc '19-20 Name: SOLUTION KEY
Dr. Quattrin
Rational Test
CALCULATOR ALLOWED
Round to 3 decimal places. Score _____
Show all work.

1. Find the zeros, VAs, and POEs of $y=\frac{3x^2-7x+2}{3x^3-x^2+12x-4}$ on $x\in[-4,\infty)$.

Show the supporting algebraic work.

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

Zeros: $(2,0)$

VAs: NONE

POE: $\left(\frac{1}{3}, -\frac{15}{37}\right)$ OR $\left(\frac{1}{3}, -.406\right)$

2. Find the extreme points of $y=\frac{3x^2-7x+2}{3x^3-x^2+12x-4}$ on $x\in[-4,\infty)$. Show the derivative and algebra to support the critical values.

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

i) $x=\frac{-4\pm\sqrt{32}}{-2}=\begin{cases}4.828\\ .828\end{cases}$ $(4.828, .107)$ $(.828, -.634)$

ii) $x^2+4=0 \Rightarrow$ NO SOLUTION

iii) $x=4$ $(-4, -.3)$

3. Find the equations of the lines tangent to and normal to $y=\frac{4x^2-13x+10}{-4x^2+x+14}$ at $x=0$?

$y(0)=5/7$

$=\frac{(4x-5)(x-2)}{-(4x+7)(x-2)}$

$\approx \frac{5-4x}{4x+7}$

Tangent: $y-\frac{5}{7}=-\frac{48}{49}(x-0)$

Normal: $y-\frac{5}{7}=\frac{49}{48}(x-0)$

$\frac{dy}{dx}=\frac{(4x+7)(-4)-(5-4x)(4)}{(4x+7)^2}$

$=\frac{-28-20}{7^2}=\frac{-48}{49}$

4. Find the zeros, VAs, POEs and EB of $y=\frac{-4x^3+x^2+16x-4}{4x^3-x^2-36x+9}$. Show the supporting algebraic work.

$=\frac{-x^2(4x-1)+4(4x-1)}{x^2(4x-1)-9(4x-1)}$

Zeros: $(\pm 2, 0)$

$\approx \frac{4-x^2}{x^2-9}$

VAs: $x=\pm 3$

POE: $(1/4, -65/143)$

5. Find the extreme points of $y=\frac{-4x^3+x^2+16x-4}{4x^3-x^2-36x+9}$. Show the derivative and algebra to support the critical values.

$$\frac{dy}{dx} = \frac{(x^2-9)(-2x)-(4-x^2)(2x)}{(x^2-9)^2}$$

$$= \frac{10x}{(x^2-9)^2}$$

i) $\frac{dy}{dx}=0 \rightarrow x=0$ $\quad (0, -4/9)$

ii) $\frac{dy}{dx}=\text{DNE} \rightarrow x=\pm 3$

iii) END POINTS

PreCalculus Acc '19-20 Name: Solution Key

Dr. Quattrin

Rational ReTest

CALCULATOR NOT ALLOWED

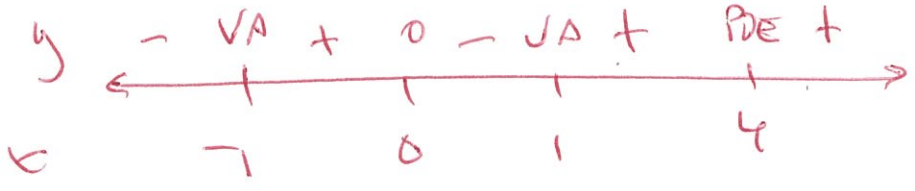
Show all work. Score _____

6. Write an equation of a rational function that has x–intercepts at (5, 0) and (-6, 0), VA at $x = 3$ and $x = 1$, a POE at $x = -1$, and a HA at $y = \frac{3}{4}$.

$$y = \frac{3(x-5)(x+6)(x+1)}{4(x-3)(x-1)(x+1)}$$

7. Show the sign pattern and solve $\frac{4x^2-16x}{x^3-4x^2-x+4} > 0$.

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



$x \in (-1, 0] \cup (1, 4) \cup (4, \infty)$

8. Find the traits and **sketch** $y=\dfrac{3x^2-7x+2}{3x^3-x^2+12x-4}$.

Domain: $x\in[-4,1/3)\cup(1/3,\infty)$, $x\neq$

Y – Intercept: $(0,-1/2)$

Zeros: $(2,0)$

Range: $y\in[-.634,.103]$

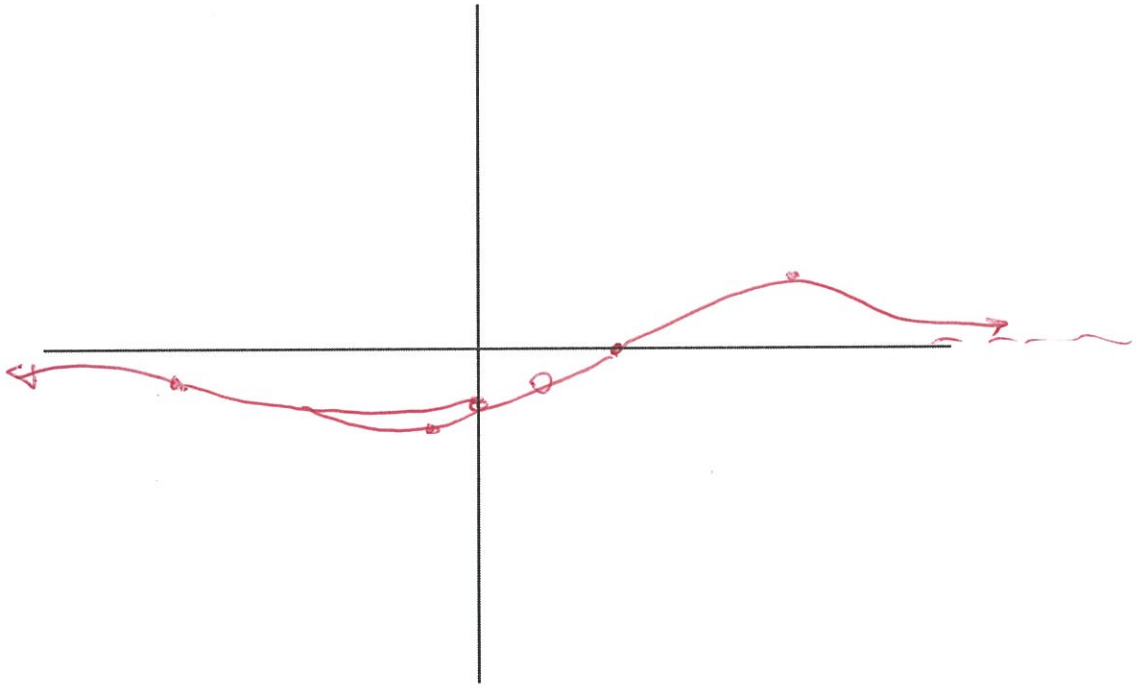
VAs: NONE

POEs: $(1/3,-15/37)$

End Behavior (left): NONE

End Behavior (right): $y=0$

Extreme Points: $(4.828,.103)$ ~~$(-4,-3/10)$~~, $(-.828,-.634)$



9. Find the traits and **sketch** of $y=\dfrac{-4x^3+x^2+16x-4}{4x^3-x^2-36x+9}$ on $x\in[-4,\infty)$.

Domain: $x\in[-4,\infty)$ BUT $x\neq 3, 1/4$ Y – Intercept: $(0,-4/9)$

Zeros: $(\pm 2, 0)$ Range: $y\in(-\infty,-1)\cup[-4/9,\infty)$

VAs: $x=\pm 3$ POEs: $(1/4,$

End Behavior (left): NONE End Behavior (right): $y=-1$

Extreme Points: $(0,-4/9)$ $(-4,-12/7)$