PreCalculus Honors '21-22 Name: Solution Key
Dr. Quattrin
Radical Functions Test
CALCULATOR ALLOWED Score _____
Round to 3 decimal places. Show all work.

1. If $y=\frac{1}{\sqrt{x^2+6}}$, then $\frac{dy}{dx}=$

$y=(x^2+6)^{1/2}$ $y'=\frac{1}{2}(x^2+6)^{-3/2}(2x)$

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

a) $\frac{-x}{(2x)^{1/2}(x^2+6)}$ b) $\frac{-x}{(x^2+6)^{3/2}}$ c) $\frac{-1}{2(x^2+6)^{3/2}}$

d) $\frac{x}{(x^2+6)^{3/2}}$ e) $\frac{-x^2-6x}{(x^2+6)}$

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2. If $y=\sqrt{\frac{3x}{x^2-9}}$, then $\frac{dy}{dx}=$ $\frac{1}{2}\left(\frac{3x}{x^2-9}\right)^{-1/2}\left[\frac{(x^2-9)(3)-(3x)(2x)}{(x^2+9)^2}\right]$

~~a)~~ $\sqrt{\frac{3}{2x}}$ ~~b)~~ $\frac{1}{2}\left(\frac{3x}{x^2-9}\right)^{-1/2}$

c) $\frac{-3x^2-27}{2(3x)^{1/2}(x^2-9)^{3/2}}$ ~~d)~~ $\frac{(3x)^{1/2}(-3x^2-27)}{(x^2-9)^{5/2}}$

~~e)~~ $\frac{-3x^2-27}{x^2-9}$

Given the functions $f(x)$ and $g(x)$ that are both continuous and differentiable, and that have values given on the table below.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
2	4	-2	8	1
4	8	8	2	3
8	2	-12	4	4

Given that $h(x)=g(g(x))$, $h'(8)=$ $g'(4)\cdot g'(8) = 3(4) = 12$

a) 16 b) 32 c) -8 d) 4 e) 1

$3x^2 - 2y\frac{dy}{dx} + 6\frac{dy}{dx} - \cancel{8}^{0} = 0$

$(6-2y)\,y' = \cancel{8} - 2x$

4. If $x^2 - y^2 + 6y - 5 = 0$, then $\frac{dy}{dx} =$ ~~$2x$~~

a) $3x^2 - 2y$ b) $\frac{3x^2+6}{-2y}$ c) $\frac{-2y+6}{3x^2}$

$y' = \frac{-3x^2}{6-2y}$

d) $\frac{3x^2}{2y-6}$ e) $3x^2 - 2y + 6$

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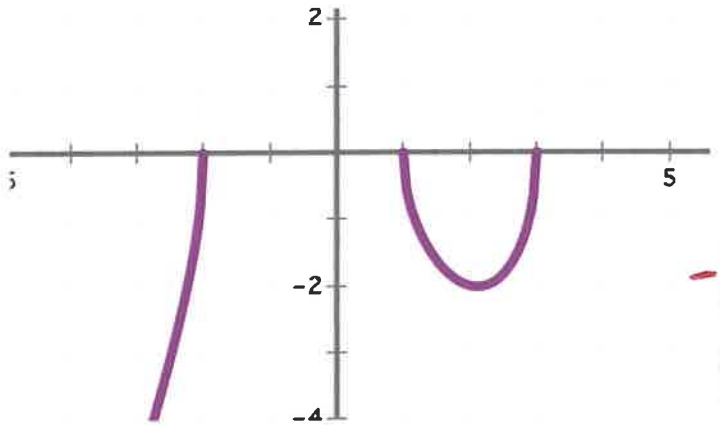
5. Which of the following equations matches the graph below?



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

$(x+2)(x^2-4x+3)$

$-(x^3-4x^2+3x+2x^2$

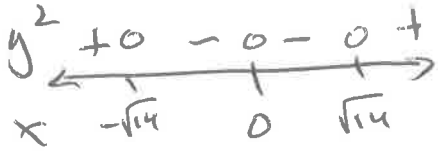
a) $y=-\sqrt{x^3-2x^2-5x+6}$

b) $y=\sqrt{-x^3+2x^2+5x-6}$

c) $y=\sqrt{x^3-2x^2-5x+6}$

d) $y=-\sqrt{-x^3+2x^2+5x-6}$

6. What is the end behavior of $y=\sqrt{3x^2\left(x^2-14\right)}$?



a) Up on the left and down on the right

b) None on the left and none on the right

c) Up on the left and none on the right

d) Up on both ends

e) Down on the left and none on the right

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7. The x-value(s) of the relative maximum(s) of $y=-\sqrt{27x-x^3}$ is/are

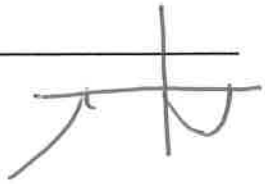
a) 3 b) $3\sqrt{6}$ c) -3 d) $0, \pm 3\sqrt{3}$ e) 0

$$\frac{dy}{dx} = -\frac{1}{2}\left(27x-x^3\right)^{-1/2}\left(27-3x^2\right)$$

$$= \frac{-3\left(9-x^2\right)}{2\left(27x-x^3\right)^{1/2}}$$

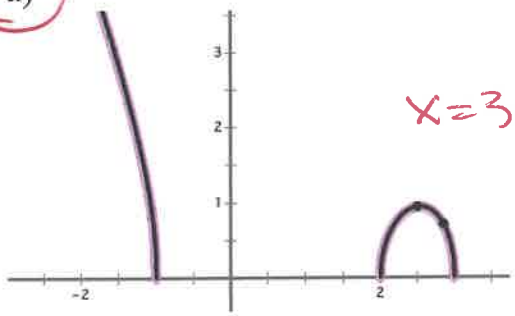
i) $x=\pm 3$

ii $x=0, \pm\sqrt{27}$



8. Which of the following graphs match the equation $y=\sqrt{-x^3+4x^2-x-6}$?

a)

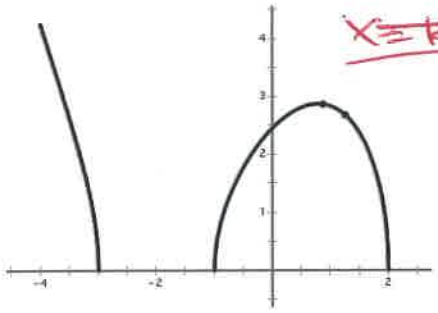


$x=3 \Rightarrow y=0$

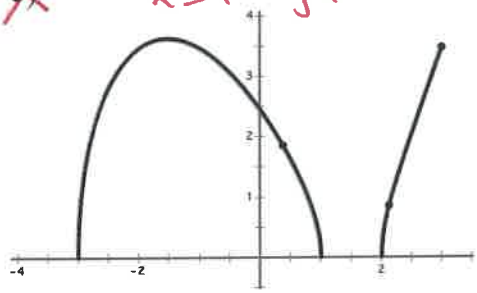
b)

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

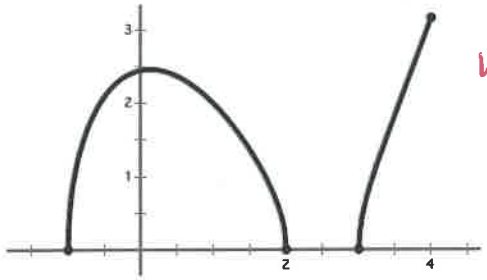
$\cancel{x=1 \Rightarrow y\neq 0}$



~~c)~~ $x=1 \Rightarrow y\neq 0$



~~d)~~



WRONG
EB

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9. A Golden Rectangle is one where the ratio (called ϕ)of the length to the short side w to the long side l is equal to the ratio of the long side to the sum of the two sides. In other words, $l=1.236w$. If a Golden Rectangle changes such that w is growing at 2 in/min, how fast is the area changing when w is 5 inches?

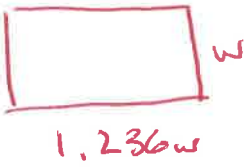
a) $1.236\ \text{in}^2/\text{min}$

b) $12.36\ \text{in}^2/\text{min}$

c) $2.472\ \text{in}^2/\text{min}$

d) $24.72\ \text{in}^2/\text{min}$

e) $30.9\ \text{in}^2/\text{min}$



$\frac{d}{dt}\left[A=1.236w^2\right]$

$\frac{dA}{dt}=2.472w\frac{dw}{dt}$

$=2.472(5)(2)$

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Radical Functions Test -- CALCULATOR ALLOWED

Round to 3 decimal places. Score _____

Show all work.

1. Find the zeros and Domain of $y=\sqrt{x^3-4x^2-7x+10}$ on $x\in[-1,6]$. Show the algebraic work to support the zeros. $(x+2)(x-1)(x-5)$

Zeros: $\cancel{(-2,0)}$ $(1,0)$ $(5,0)$

Domain:

$x\in[-2,1]\cup[5,6]$

y^2 − 0 + 0 − 0 +

−2 1 5

2. Find the Extreme Points of $y=\sqrt{x^3-4x^2-7x+10}$ on $x\in[-1,6]$. Show the algebraic work to support the critical values.

Extreme Points:

$(-1, 3.464)$

$(6, 6.325)$

$\cancel{(2,}$ $(1,0)$

$(5,0)$

$(-.695, 3.548)$

$$\frac{dy}{dx} = \frac{3x^2-8x-7}{2(x^3-4x^2-7x+10)^{1/2}} =$$

i) $\frac{dy}{dx}=0 \rightarrow x=\frac{8\pm\sqrt{8^2-4(3)(-7)}}{2(3)} = \begin{cases} \cancel{3.3}\ 1 \\ -.695 \end{cases}$

ii) $\frac{dy}{dx}$ DNE $\rightarrow x=-2,1,5$

iii) $x=-1,6$

3. Find the zeros, VAs, and domain of $y=-\sqrt{\dfrac{3x^2+11x-4}{3x^2+5x-2}}$. Show the Algebra that supports your answer.

Zeros: $x=(4,0)$

VAs: $x=-2$

Domain:

$x\in(-\infty,-4]\cup(-2,\tfrac{1}{3})\cup(\tfrac{1}{3},\infty)$ POE $\left(\tfrac{1}{3}\pm\sqrt{13}/7\right)$

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

y^2: $+$ 0 $-$ VA $+$ POE $+$

x: -4 -2 $1/3$

4. Find the Extreme Points of $y=-\sqrt{\dfrac{3x^2+11x-4}{3x^2+5x-2}}$. Show the Algebra and derivative that supports your answer.

Extreme Points:

$(-4,0)$

$$y\approx-\left(\frac{x+4}{x+2}\right)^{1/2}$$

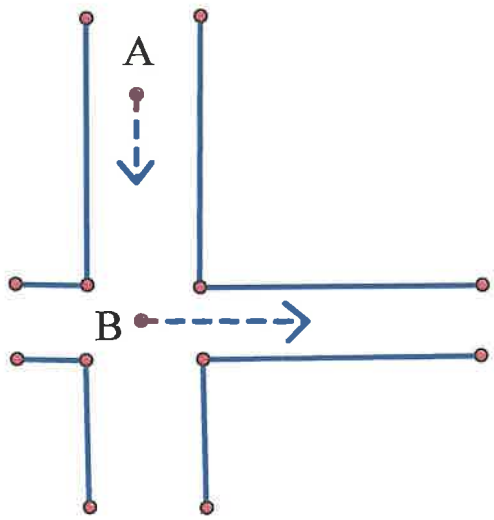
$$\frac{dy}{dx}=-\frac{1}{2}\left(\frac{x+4}{x+2}\right)^{-1/2}\left[\frac{(x+2)(1)-(x+4)(1)}{(x+2)^2}\right]$$

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

i) NONE

ii) $x=-2,-4$

iii) NONE



5. Person A is 220 feet north of an intersection and walking toward it at $10\ ft/sec$. Person B starts at the intersection and walks east at $5\ ft/sec$.

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a) At $t = 10$ seconds, how far is each person from the intersection?

A = 220 − 10(10) = 120 FT

B) = 0 + 5(10) = 50FT

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b) At $t = 10$ seconds, how far apart are the two people?

$50^2 + 120^2 = r^2$ r = 130

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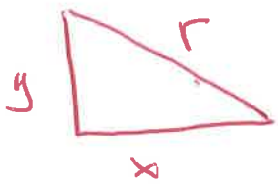
c) How fast is the distance between the two people changing at $t = 10$ seconds?



$$x^2 + y^2 = r^2$$

$$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2r\frac{dr}{dt}$$

$$2(120)(-10) + 2(50)(5) = 2(130)\frac{dr}{dt}$$

$$\frac{dr}{dt} = -7.308\ \frac{\text{FT}}{\text{SEC}}$$

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d) If person A looks at person B when $t = 10$ seconds. How fast is the angle changing?

$$\frac{d}{dt}\left\{\tan\theta = \frac{x}{r}\right\}$$

$$\left(\frac{r}{x}\right)^2 \sec^2\theta\ \frac{d\theta}{dt} = \frac{r\frac{dx}{dt} - x\frac{dr}{dt}}{r^2}$$

$$\frac{(130)^2}{120^2}\left(\frac{d\theta}{dt}\right) = \frac{120(5) - 50(-10)}{(120)^2}$$

$$\frac{d\theta}{dt} = .065\ \frac{\text{RAD}}{\text{SEC}}$$

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Radical Functions Test – NO CALCULATOR ALLOWED

Show all work.

6. Find the traits and **sketch** $y=\sqrt{x^3-4x^2-7x+10}$ on $x\in[-1, 6]$.

Domain: $x \in [-1,1] \cup [5,6]$

Range: $y \in [0, 6.325]$

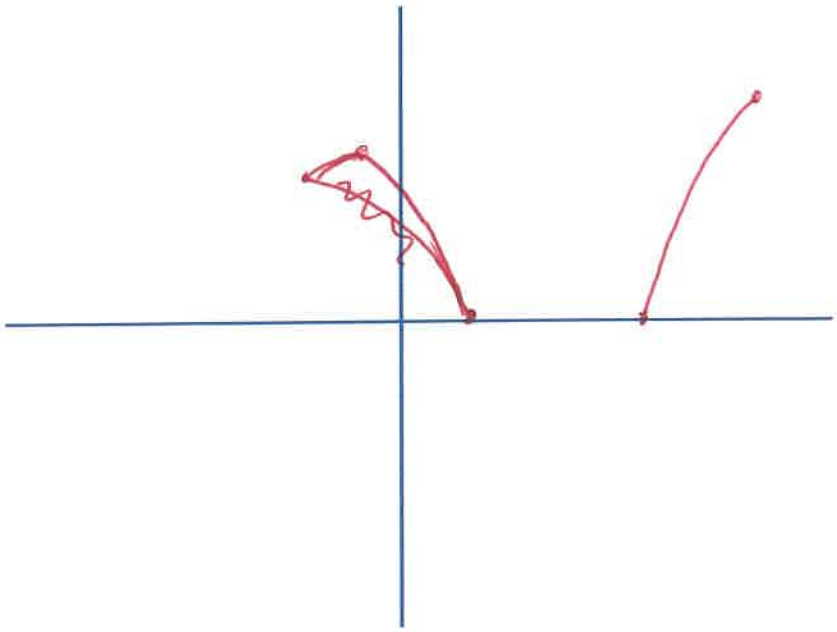
Y – Int: $(0, \sqrt{10})$

Zeros: $(+1,0)$ $(5,0)$

Extreme Points: See #2

End Behavior (Left): None

End Behavior (Right): None



7. List the traits and **sketch** of $y=-\sqrt{\dfrac{3x^2+11x-4}{3x^2+5x-2}}$.

Domain: S 2E #3

Range: $y \in \left(-\infty, -\sqrt{\frac{13}{3}}\right) \cup \left(-\sqrt{\frac{13}{3}}, -1\right) \cup (-1, 0]$

$Y-$Int: $(0, \sqrt{2})$

VAs: $x = -2$

Zeros: $(-4, 0)$

Extreme Points: $(-4, 0)$

End Behavior (Left): $y = -1$

End Behavior (Right): $y = -1$