

PreCalculus Honors '16-17

Dr. Quattrin

Radical Functions Test

CALCULATOR ALLOWED

Round to 3 decimal places. Show all work.

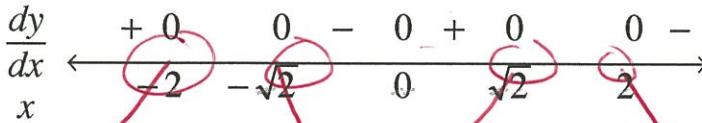
Name: Solution Key

Score 20

1. If $f(x)$ be the function $f(x) = h(x^2 - 3)$, $f'(2) = h'(x^2 - 3) \cdot 2x$

- a. $h'(1)$ b. $4h'(1)$ c. $4h'(2)$ d. $h'(4)$ e. $4h'(4)$

(2 pts)

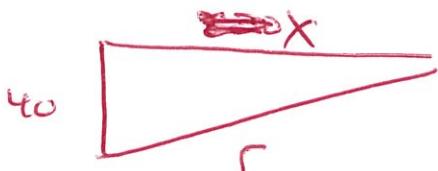
2. Given this sign pattern 

what value of x does f have a local maximum?

- (a) -2 (b) $-\sqrt{2}$ (c) $\sqrt{2}$ (d) All of these (e) None of these

3. A sidewalk and a road cross at right angles. An observer stands on the sidewalk 40 meters south of the crossing and watches an eastbound car traveling at 50 meters per second. At how many meter per second is the car moving away from the observer 4 seconds after it passes through the intersection?

- a) 50.00 b) 49.03 c) 51.02 d) 49.22 e) 64.03



$$40^2 + r^2 = x^2$$

$$2r \frac{dr}{dt} = 2r \frac{dx}{dt}$$

$$2(40)(50) = 2(\sqrt{4100}) \frac{dr}{dt}$$

$$h'(x) = \frac{3}{4} (x^2 - 4)^{\frac{3}{4}} (2x)$$

4. If $h(x) = (x^2 - 4)^{\frac{3}{4}} + 1$, then the value of $h'(2)$ is

- a) 3 b) 2 c) 1 d) 0 e) dne

5. Consider the closed curve in the $x-y$ plane given by $2x^2 + 5x + y^2 + y = 8$.

Which of the following is correct:

$$(a) \frac{dy}{dx} = -\frac{4x+5}{8x+2y+1}$$

$$(b) \frac{dy}{dx} = \frac{4x+5}{2y+1}$$

$$(c) \frac{dy}{dx} = -\frac{4x+5}{8x+2y}$$

$$(d) \frac{dy}{dx} = \frac{4x+5}{8x+2y}$$

$$(e) \frac{dy}{dx} = -\frac{4x+5}{2y+1}$$

$$4x+5+2y \frac{dy}{dx} + 1 \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = \frac{-4x-5}{2y+1}$$

6. 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	10	8	4	3
8	6	-12	2	4

Given that $h(x) = f(g(x))$, $h'(8) = f'(2) \cdot g'(4) = (-2)(4) = -8$

- a) -12 b) -2 c) -1 d) -8 e) 10
-

7. Find the absolute minimum value of $y = \sqrt{36 - x^2}$ on the interval $x \in [-2, 2]$.

- a) -2 b) 0 c) 0 d) $4\sqrt{2}$ e) 6
-

$$y(0) = 6$$

$$y(\pm 2) = 4\sqrt{2}$$

$$\text{i)} \frac{dy}{dx} = \frac{1}{2}(36-x^2)^{-\frac{1}{2}}(-2x) = \begin{cases} 0 \rightarrow x=0 \\ \text{DNE} \rightarrow x=\pm 6 \end{cases}$$

$$\text{ii)} \cancel{x=\pm 6}$$

$$\text{iii)} \cancel{x=\pm 6} \quad x=\pm 2$$

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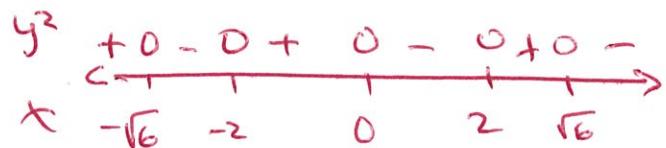
Show all work.

1. Find the zeros and Domain of $y = \sqrt{-x^5 + 10x^3 - 24x}$. Show the algebraic work to support the zeros and critical values.

Zeros: $(0, 0), (\pm 2, 0), (\pm \sqrt{6}, 0)$

$$\begin{aligned} & -x(x^4 - 10x^2 + 24) \\ & -x(x^2 - 4)(x^2 - 6) \end{aligned}$$

Domain: $(-\infty, -\sqrt{6}] \cup [2, 0] \cup [2, \sqrt{6}]$



2. Find the Extreme Points of $y = \sqrt{-x^5 + 10x^3 - 24x}$. Show the algebraic work to support the zeros and critical values.

Extreme Points: $(\pm 2, 0), (0, 0), (\pm \sqrt{6}, 0), (-0.975, 3.875), (2.247, 1.497)$

$$\frac{dy}{dx} = \frac{1}{2}(-x^5 + 10x^3 - 2x)^{-\frac{1}{2}}(-5x^4 + 30x^2 - 24)$$

$$i) -5x^4 + 30x^2 - 24 = 0 \rightarrow x^2 = \frac{-30 \pm \sqrt{30^2 - 4(-5)(-24)}}{-10} = \begin{cases} 1.951 \\ 5.049 \end{cases}$$

$$x = \pm 1.957, \pm 2.247 \rightarrow x = -0.975, -2.247$$

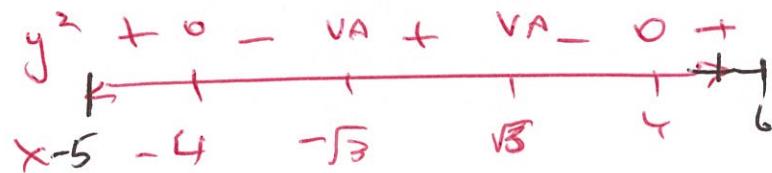
$$ii) \frac{dy}{dx} \text{ DNE} \rightarrow x = 0, \pm \sqrt{6}, \pm 2$$

3. Find the zeros, VAs, and domain of $y = -\sqrt{\frac{x^2-16}{x^2-3}}$ on $x \in [-5, 6]$. Show the Algebra that supports your answer.

Zeros: $\cancel{x}(\pm 4, 0)$

VAs: $x = \pm \sqrt{3}$

Domain: $x \in [-5, -4] \cup (-\sqrt{3}, \sqrt{3}) \cup [4, 6]$

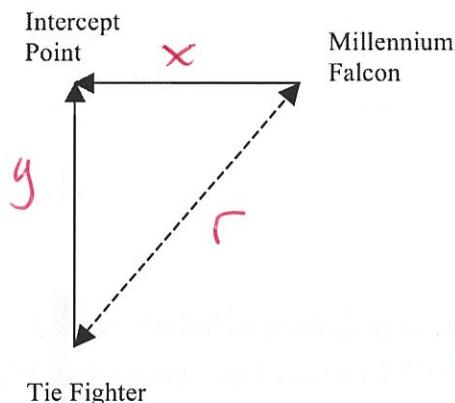


4. Find the Extreme Points of $y = -\sqrt{\frac{x^2-16}{x^2-3}}$ on $x \in [-5, 6]$. Show the Algebra that supports your answer.

Extreme Points: $(0, 2.309)$, $(\pm 4, 0)$, $(-5, -0.650)$, $(6, -0.778)$

$$\frac{dy}{dx} = -\frac{1}{2} \left(\frac{x^2-16}{x^2-3} \right)^{-\frac{1}{2}} \left[\frac{(x^2-16)(2x) - (x^2-16)2x}{(x^2-3)^2} \right] = \frac{-26x}{2(x^2-3)^{\frac{3}{2}}(x^2-16)^{\frac{1}{2}}}$$

5. Darth Vader is pursuing Luke Skywalker in an Imperial Tie Fighter. He is travelling in a straight line at 150 million meters per second. He is 40 million meters from the intercept point, and Han Solo is moving on an intercept course perpendicular to Darth Vader's course. His ship, the Millennium Falcon is cruising at 75 million meters per second to avoid sensor detection, and he is 20 million meters from the intercept point. Darth Vader's sensors are tuned to detect anything approaching his vessel with a direct **speed** of greater than 120 million meters per second. Does the Millennium Falcon escape detection or not?



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

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

$$\frac{dy}{dt} = -150$$

$$y = 40$$

$$\frac{dx}{dt} = 75$$

$$x = 20$$

$$\frac{dy}{dt} = \cancel{\frac{dy}{dt}} \quad r = \cancel{r} \sqrt{2000}$$

$$+\cancel{\frac{20}{20}}(-75) + \cancel{\frac{40}{40}}(-150) = \sqrt{2000} \frac{dr}{dt}$$

$$\frac{dr}{dt} = \cancel{-150} \quad 167.705$$

No

6. A particular velocity function is given by the equation

$v(t) = B \sqrt{\left[\left(\frac{H(t)}{A} + 3t \right)^{\frac{3}{7}} - 4 \right]}$ where A and B are. What is the equation for the acceleration?

$$v'(t) = \frac{B}{2} \left(\left(\frac{H(t)}{A} + 3t \right)^{\frac{3}{7}} - 4 \right)^{-\frac{1}{2}} \left(\frac{3}{7} \left(\frac{H(t)}{A} + 3t \right)^{-\frac{4}{7}} \right) \cdot \left(\frac{1}{A} H'(t) + 3 \right)$$

$$= \frac{3B}{7A} \frac{(H'(t) + 3A)}{\left(\frac{H(t)}{A} + 3t \right)^{\frac{3}{7}} - 4}^{\frac{1}{2}} \left(\frac{H(t)}{A} + 3t \right)^{\frac{4}{7}}$$

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Show all work.

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7. Find the traits and sketch $y = \sqrt{-x^5 + 10x^3 - 24x}$.

Domain: See #1

Range: $y \in [0, \infty)$

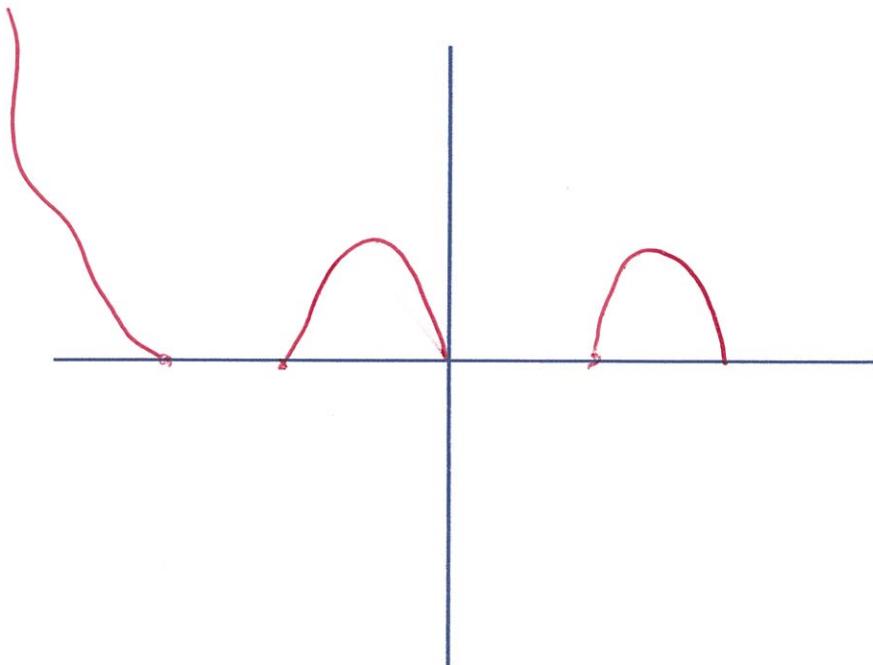
Y-Int: $(0, 0)$

Zeros: See #1

Extreme Points: See #2

End Behavior (Left): Up

End Behavior (Right): None



8. List the traits and sketch of $y = -\sqrt{\frac{x^2 - 16}{x^2 - 3}}$ on $x \in [-5, 6]$.

Domain: $S \in \mathbb{R} \setminus \{-4, 4\}$

Y-Int: $(0, -4\sqrt{3})$

Zeros: $(\pm 4, 0)$

End Behavior (Left): None

End Behavior (Right): None

Range: $y \in (-\infty, -4\sqrt{3}] \cup [-7.78, 0]$

VAs: $x = \pm\sqrt{3}$

Extreme Points: $S \in \{4\}$

