

PreCalculus '13-14

Name: SOLUTION KEY

Dr. Quattrin

Radical Test-- CALCULATOR ALLOWED

Round to 3 decimal places.

Score \_\_\_\_\_

Show all work.

1. Find the zeros and Domain of  $y = \sqrt{-2x^3 + 7x^2 + 18x - 63}$ . Show the supporting algebraic work.

$$-x^2(2x-7) + 9(2x-7)$$

$$(9-x^2)(2x-7) = 0$$

$$\text{Zeros } (\pm 3, 0) \quad (7/2, 0)$$



$$\text{Domain } x \in (-\infty, -3] \cup [3, 3.5]$$

2. Find the critical values and extreme values of  $y = \sqrt{-2x^3 + 7x^2 + 18x - 63}$ . Show the derivative and algebra to support the critical values.

$$\frac{dy}{dx} = \frac{-6x^2 + 14x + 18}{2(-2x^3 + 7x^2 + 18x - 63)^{1/2}} = \frac{-3x^2 + 7x + 9}{(-2x^3 + 7x^2 + 18x - 63)^{1/2}}$$

$$\frac{dy}{dx} = 0 \Rightarrow x = \frac{-7 \pm \sqrt{49 - 4(-3)(9)}}{2(-3)} = \begin{cases} -0.928 \\ 3.255 \end{cases} \rightarrow y = .884$$

$$\frac{dy}{dx} = \text{DNE} \Rightarrow -2x^3 + 7x^2 + 18x - 63 = 0$$

$$x = \pm 3, 7/2 \rightarrow y = 0$$

3. Find the critical values of  $y = \sqrt{x^4 - 11x^2 + 18}$  on  $x \in [-4, 4]$ .

$$\frac{dy}{dx} = \frac{4x^3 - 22x}{2(x^4 - 11x^2 + 18)^{1/2}}$$

Domain  $y^2 + 0 - 0 + 0 - 0 +$   
 $-4 \quad -3 \quad -\sqrt{2} \quad \sqrt{2} \quad 3 \quad 4$

NOT IN DOMAIN

i)  $\frac{dy}{dx} = 0 \rightarrow 4x^3 - 22x = 2x(2x^2 - 11) \Rightarrow \boxed{x=0} \pm \sqrt{\frac{11}{2}}$

ii)  $\frac{dy}{dx} = 0 \rightarrow \boxed{x = \pm 3, \pm \sqrt{2}}$

iii) END POINTS  $\boxed{x = \pm 4}$

4. Find the zeros, VAs, and Domain of  $y = \sqrt{\frac{-18x}{x^2+1}}$ . Show the supporting algebraic work.

Zeros (0, 0)

VAs: NONE

Domain  $x \in (-\infty, 0]$

$y^2$   $+ \quad 0 \quad -$   
 $x$   $\leftarrow \quad \quad \quad \rightarrow$   
 $0$

5. Find the critical values and extreme values of  $y = \sqrt{\frac{-18x}{x^2+1}}$ . Show the derivative and algebra to support the critical values.

$$\begin{aligned} \frac{dy}{dx} &= \frac{1}{2} \left( \frac{-18x}{x^2+1} \right)^{-1/2} \left[ \frac{(x^2+1)(-18) - (-18x)(2x)}{(x^2+1)^2} \right] \\ &= \frac{1}{2} \frac{(x^2+1)^{1/2}}{(-18x)^{1/2}} \left[ \frac{18x^2-18}{(x^2+1)^2} \right] \\ &= \frac{9x^2-9}{(-18x)^{1/2}(x^2+1)^{3/2}} \end{aligned}$$

$$\frac{dy}{dx} = 0 \Rightarrow x = \overset{\text{NOT IN DOMAIN}}{\cancel{\pm 1}} \rightarrow x = -1 \quad \rightarrow y = 3$$

$$\frac{dy}{dx} \text{ DNE} \rightarrow x = 0 \quad \rightarrow y = 0$$

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Show all work.

Score \_\_\_\_\_

6a.  $\frac{d}{dx}[(2x^3 - 9x)^{15}]$

$$= 15(2x^3 - 9x)^{14} (6x^2 - 9)$$

6b.  $\frac{d}{dx}[\sqrt[3]{3x^2 - 12x + 5}]$

$$= \frac{1}{3} (3x^2 - 12x + 5)^{-2/3} (6x - 12)$$
$$= \frac{2x - 4}{(3x^2 - 12x + 5)^{1/2}}$$

7. Find the traits and sketch  $y = \sqrt{-2x^3 + 7x^2 + 18x - 63}$ .

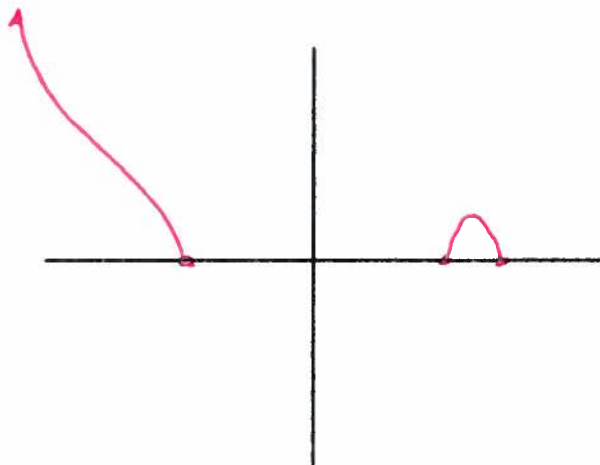
Domain:  $x \in [-\infty, -3] \cup [3, 3.5]$  Range:  $y \in [0, \infty)$

Y-Int: NONE

End Behavior: LEFT = UP RIGHT = NONE

Zeros:  $(-3, 0)$   $(3.5, 0)$

Extreme Points:  $(-3, 0)$ ,  $(3.5, 0)$ ,  
 $(3.255, .884)$



8. Find the traits and sketch of  $y = \sqrt{\frac{-18x}{x^2+1}}$ .

Domain:  $x \in (-\infty, 0]$

Y-Int:  $(0, 0)$

Zeros:  $(0, 0)$

Range:  $y \in [0, 3]$

VAs: NONE

End Behavior: LEFT  $y = 0$   
RIGHT NONE

POEs: NONE

Extreme Points:

$(0, 0)$   $(-1, 3)$

