

PreCalculus '14-15

Name: SOLUTION KEY

Dr. Quattrin

Polynomials Test-- CALCULATOR ALLOWED

Round to 3 decimal places.

Score 90

Show all work.

1. Find the zeros of  $y = 3x^3 - x^2 - 12x + 4$ . Show the algebraic work to support the zeros.

$$0 = x^2(3x-1) - 4(3x-1)$$

$$= (x^2 - 4)(3x - 1)$$

$$x = \pm 2, \frac{1}{3}$$

$$(\pm 2, 0) \quad \left(\frac{1}{3}, 0\right)$$

2. Find the extreme points of  $y = 3x^3 - x^2 - 12x + 4$ . Show the derivative and algebra to support the critical values.

$$\frac{dy}{dx} = 9x^2 - 2x - 12 = 0$$

$$x = \frac{2 \pm \sqrt{4 - 4(9)(-12)}}{2(9)} = \begin{cases} 1.231 \\ -1.079 \end{cases}$$

$$\begin{cases} (1.231, -6.708) \\ (-1.079, 12.025) \end{cases}$$

3. Find the zeros of  $y = x^4 - 29x^2 + 100$ . Show the algebraic work to support the zeros.

$$\begin{aligned}(x^2 - 25)(x^2 - 4) &= 0 \\(x - 5)(x + 5)(x - 2)(x + 2) &= 0 \\x &= \pm 5, \pm 2 \\(\pm 5, 0), (\pm 2, 0)\end{aligned}$$

4. Find the extreme points of  $y = x^4 - 29x^2 + 100$ . Show the derivative and algebra to support the critical values.

$$\begin{aligned}\frac{dy}{dx} &= 4x^3 - 58x = 0 \\2x(2x^2 - 29) &= 0 \\x &= 0, \pm \sqrt{\frac{29}{2}} \\(0, 100), (\pm 3.808, -110.25)\end{aligned}$$

5. The sign pattern for the derivative of  $H(x)$  is given. (a) Is  $x = -4$  at a maximum, a minimum, or neither? Why? (b) Is  $x = 2$  at a maximum, a minimum, or neither? Why?

$$\begin{array}{ccccccc} & & - & 0 & + & 0 & + & 0 & - \\ & & & & & & & & \\ \frac{dH}{dx} & \leftarrow & & & & & & & \rightarrow \\ x & & -4 & & -1 & & 2 & & \end{array}$$

- a)  $x = -4$  IS AT A MIN BECAUSE THE SIGN OF  $\frac{dH}{dx}$  SWITCHES FROM - TO +

b)

$x = 2$  IS AT A MAX BECAUSE THE SIGN OF  $\frac{dH}{dx}$  SWITCHES FROM + TO -

6. Given this sign pattern for the derivative  $G'(x)$ , what are the intervals of increasing?

$$G' > 0$$

$$\begin{array}{ccccccc} & & + & 0 & - & 0 & + & 0 & - \\ & & & & & & & & \\ G'(x) & \leftarrow & & & & & & & \rightarrow \\ x & & -6 & & \frac{1}{4} & & 3 & & \end{array}$$

$$x \in (-\infty, -6) \cup (\frac{1}{4}, 3)$$

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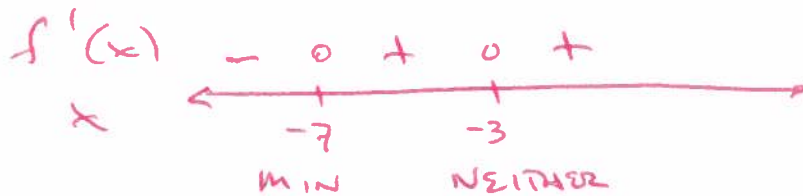
Dr. Quattrin

Polynomials Test—CALCULATOR NOT ALLOWED

Show all work.

Score \_\_\_\_\_

6. Create a sign pattern for the function  $f'(x)$  if  $f(x)$  is decreasing from  $-\infty$  to  $-7$ , increasing from  $-7$  to  $3$ , and increasing from  $3$  to  $\infty$ . Be sure to label the sign pattern appropriately. Then, determine whether each critical value represents a max, a min, or neither. Explain how you know for each.



7. Find the traits and sketch  $y = 3x^3 - x^2 - 12x + 4$ .

Domain: ALL REALS

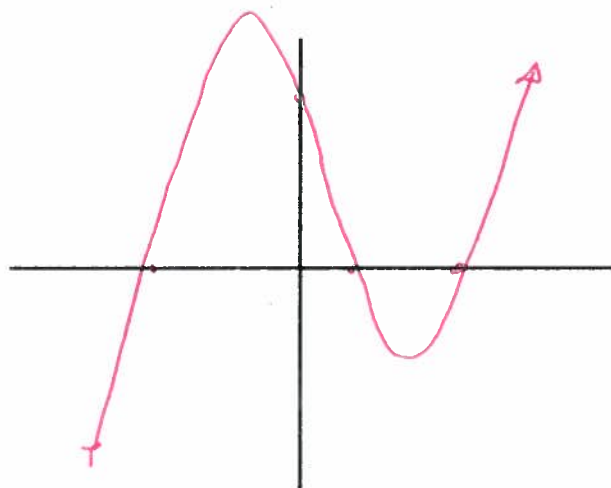
Range: ALL REALS

Y-Int: (0, 4)

End Behavior: ~~↘~~ RIGHT END UP  
LEFT END DOWN

Zeros: (±2, 0) (1/3, 0)

Extreme Points: (1.231, -6.708)  
(-1.079, 12.025)



8. Find the traits and sketch of  $y = x^4 - 29x^2 + 100$ .

Domain: All reals

Range:  $y \in [-110.25, \infty)$

Y-Int:  $(0, 100)$

End Behavior: Both ends up

Zeros:  $(\pm 5, 0)$   $(\pm 2, 0)$

Extreme Points:  $(0, 100)$   
 $(\pm 3.808, -110.25)$

