

1. Determine the roots algebraically by factoring. (Solve for x). Show work.

⑤

$$2x^4 - 75x = 50x^2 - 3x^3$$

$$0 = 2x^4 + 3x^3 - 50x^2 - 75x$$

$$0 = x^3(2x+3) - 25x(2x+3)$$

$$0 = (x^3 - 25x)(2x+3)$$

$$0 = x(x^2 - 25)(2x+3)$$

$$0 = x(x-5)(x+5)(2x+3)$$

$$\begin{matrix} \swarrow & \downarrow & \downarrow & \downarrow \\ x=0 & x-5=0 & x+5=0 & 2x+3=0 \\ & x=5 & x=-5 & x=-\frac{3}{2} \end{matrix}$$

→ The roots are 0, 5, -5 and -1.5

2. Solve for x and graph final solution on a number-line.

④

$$-4(3 - 5x) < 3(4x + 4)$$

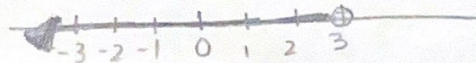
$$-12 + 20x < 12x + 12$$

$$-12 - 12 < 12x - 20x$$

$$-24 < -8x$$

$$\frac{-24}{-8} > x$$

$$3 > x$$



3. Solve the following inequality algebraically and write solution using set notation and using interval notation.

⑤

$$-3 < \frac{17-4x}{5} \leq 5$$

$$-15 < 17-4x \leq 25$$

$$-15-17 < -4x \leq 25-17$$

$$-32 < -4x \leq 8$$

$$\frac{-32}{-4} > x \geq \frac{8}{-4}$$

$$8 > x \geq -2$$

→ Set Notation

$$\{x \in \mathbb{R} \mid 8 > x \geq -2\}$$

Interval notation

$$[-2, 8)$$

4. Solve (find intervals) for the following using a factor table. Express answers using set and interval notation. Show work. DO NOT graph.

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$$-3x(x+2)(x-5)(x-3) \geq 0$$

Zeros: $-2, 0, 3, 5$

Intervals: $x \leq -2, -2 < x < 0, 0 < x < 3, 3 < x < 5, x \geq 5$

don't need leading coefficient
You have $-3x$ as the l.c.

	$x \leq -2$	$-2 < x < 0$	$0 < x < 3$	$3 < x < 5$	$x \geq 5$
$-3x$	+	+	-	-	-
$(x+2)$	-	+	+	+	+
$(x-5)$	-	-	-	-	+
$(x-3)$	-	-	-	+	+
Sign	-	+	-	+	-

Set notation:

$$\{x \in \mathbb{R} \mid -2 \leq x \leq 0, 3 \leq x \leq 5\}$$

Interval notation:

$$[-2, 0]$$

$$[3, 5]$$

5. Given $f(x) = x^4 - 4x^3 - 5x^2 + 36x - 36$

a) Find the average rate of change for $x \in [-1, 1]$. Show work.

② $-1 \leq x \leq 1$ Points: $(-1, -72), (1, -8)$
 $x_1, y_1 \quad x_2, y_2$
 $AROC = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-8 - (-72)}{1 - (-1)} = \frac{64}{2} = 32$ $AROC = 32$

$$f(-1) = (-1)^4 - 4(-1)^3 - 5(-1)^2 + 36(-1) - 36 = 1 + 4 - 5 - 36 - 36 = -72$$

$$f(1) = 1 - 4 - 5 + 36 - 36 = -8$$

b) Find the instantaneous rate of change at $x = 3$ and $x = -2$. (use $h = 0.001$). Show work.

④ for $x = 3$

$$\frac{f(a+h) - f(a)}{h}$$

$$\frac{f(3+0.001) - f(3)}{0.001}$$

$$= \frac{0.00601301 - 0}{0.001}$$

$$= 6.01301$$

④ for $x = -2$

$$\frac{f(-1.999) - f(-2)}{0.001}$$

$$= \frac{47.92004799 - 107.980005}{0.001}$$

$$= \frac{-80.02395701}{0.001}$$

$$= -23.95701$$

c) Which value of x from b) is at a turning point? Explain.

① $(x-3)(x+3)(x^2-4x+4)$ Neither
 $(x-3)(x+3)(x-2)(x-2)$ Zero

$\rightarrow -2$ is a turning point because when graphed it makes a slope of 0 at the turning point (degree 2)

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