

# Graphing Technology Lab

## Solving Polynomial Inequalities

Sharp EL-9900C

You can use a Sharp EL-9900C graphing calculator to solve polynomial inequalities.

### ACTIVITY

Solve  $x^4 + 2x^3 \leq 7$ .

Clear the calculator memory first.

KEYSTROKES:  $\boxed{2\text{ndF}}$   $\boxed{[\text{OPTION}]}$   $\boxed{[\text{ALPHA}]}$   $\boxed{[E]}$   $\boxed{2}$   $\boxed{[\text{CL}]}$   $\boxed{[\text{ENTER}]}$

#### Method 1

**Step 1** In a standard viewing window, graph each side of the related equation separately.

KEYSTROKES:  $\boxed{Y=}$   $\boxed{[X/\theta/\tau/n]}$   $\boxed{[a^b]}$   $\boxed{4}$   $\boxed{[\blacktriangleright]}$   $\boxed{+}$   $\boxed{2}$

$\boxed{[X/\theta/\tau/n]}$   $\boxed{[a^b]}$   $\boxed{3}$   $\boxed{[\text{ENTER}]}$   $\boxed{7}$   $\boxed{[\text{ZOOM}]}$   $\boxed{5}$ : Default

**Step 2** Find the points of intersection.

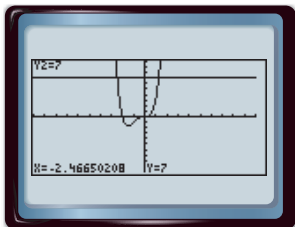
KEYSTROKES:  $\boxed{2\text{ndF}}$   $\boxed{[\text{CALC}]}$   $\boxed{2}$ : Intsct

The intersection will be flashing. Select the tool again to find the second intersection.

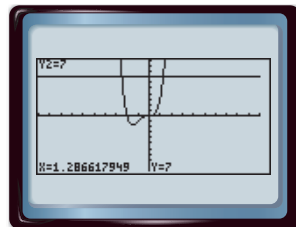
**Step 3** Examine the graphs.

Determine where the graph of  $y = x^4 + 2x^3$  intersects and is below  $y = 7$ .

The solution is approximately  $-2.47 \leq x \leq 1.29$ .



$[-10, 10]$  scl: 1 by  $[-10, 10]$  scl: 1



$[-10, 10]$  scl: 1 by  $[-10, 10]$  scl: 1

#### Method 2

**Step 1** Graph the related equation equal to 0.

$$x^4 + 2x^3 = 7$$

$$x^4 + 2x^3 - 7 = 0$$

KEYSTROKES:  $\boxed{Y=}$   $\boxed{[\text{CL}]}$   $\boxed{[X/\theta/\tau/n]}$   $\boxed{[a^b]}$   $\boxed{4}$   $\boxed{[\blacktriangleright]}$   $\boxed{+}$   $\boxed{2}$

$\boxed{[X/\theta/\tau/n]}$   $\boxed{[a^b]}$   $\boxed{3}$   $\boxed{[\blacktriangleright]}$   $\boxed{-}$   $\boxed{7}$   $\boxed{[\text{ENTER}]}$   $\boxed{[\text{CL}]}$

$\boxed{[\text{ZOOM}]}$   $\boxed{5}$ : Default

**Step 2** Find the  $x$ -intercepts.

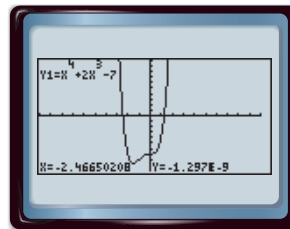
KEYSTROKES:  $\boxed{2\text{ndF}}$   $\boxed{[\text{CALC}]}$   $\boxed{5}$ : X\_Incpt

The intersection will be flashing. Select the tool again to find the second intersection.

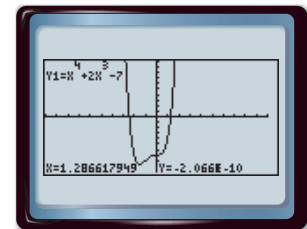
**Step 3** Examine the graphs.

Determine where the graph of  $y = x^4 + 2x^3 - 7$  is below the  $x$ -axis.

The solution is approximately  $-2.47 \leq x \leq 1.29$ .



$[-10, 10]$  scl: 1 by  $[-10, 10]$  scl: 1



$[-10, 10]$  scl: 1 by  $[-10, 10]$  scl: 1

### Exercises

Solve each inequality. Round to the nearest hundredth.

1.  $\frac{2}{3}x^3 + x^2 - 5x \geq -9$

2.  $x^3 - 9x^2 + 27x \leq 20$

3.  $x^3 + 1 \geq 4x^2$

4.  $x^6 - 15 \leq 5x^4 - x^2$

5.  $\frac{1}{2}x^5 \geq \frac{1}{5}x^2 - 2$

6.  $x^8 < -x^7 + 3$

7.  $x^4 - 15x^2 > -24$

8.  $x^3 - 6x^2 + 4x < -6$

9.  $x^4 - 15x^2 + x + 65 > 0$