EXAMPLE 2 **Solving a Polynomial Inequality Analytically**

Solve $2x^3 - 7x^2 - 10x + 24 > 0$ analytically.

Want to break into factors, use the rational root theorem.

$\frac{24}{2} = \frac{\pm 1, 2, 3, 4, 6, 8, 12, 24}{\pm 1, 2}$ combos $\pm 1, 2, 3, 4, 6, 8, 12, 24, \frac{1}{2}, \frac{3}{2}$

$$\begin{array}{r|rrrr} 2 & 2 & -7 & -10 & 24 \\ & \downarrow & 4 & -6 & -32 \\ \hline & 2 & -3 & -16 & \boxed{-8} \end{array}
\qquad
\begin{array}{r|rrrr} 6 & 2 & -7 & -10 & 24 \\ & \downarrow & 12 & 30 & 120 \\ \hline & 2 & 5 & 20 & \end{array}
\qquad
\begin{array}{r|rrrr} 4 & 2 & -7 & -10 & 24 \\ & \downarrow & 8 & 4 & -24 \\ \hline & 2 & 1 & -6 & \boxed{0} \end{array}$$

$(x-4)(2x^2+x-6)$

$(x-4)(2x-3)(x+2) > 0$

SIGN CHART

$-2 \quad 1.5 \quad 4$

$x \le -2$	$-2 \le x \le 1.5$	$1.5 \le x \le 4$	$x \ge 4$
$(-)$	$(+)$	$(-)$	$(+)$
EB ↳ deg			REB ↳ LC

Leading coef. 2 REB ∞

Degree 3 EB diff

ANS to $P(x) > 0$ is → where function is strictly ABOVE x-axis

$\rightarrow (-2, 1.5) \cup (4, \infty)$

EXAMPLE 3 **Solving a Polynomial Inequality Graphically**

Solve $x^3 - 6x^2 \le 2 - 8x$ graphically.

$P(x) \le 0$

$\underbrace{x^3 - 6x^2 + 8x - 2}_{Y_1} \le 0$

Enter $P(x)$ into Y_1

Fix windows

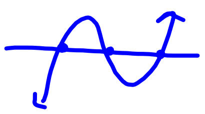
Keep in mind EB

$\lim_{x \to \infty} P(x) =$ $\lim_{x \to -\infty} P(x) =$

Find any zeros

↳ needed for interval notation

x=0.325, 1.461, 4.214



$P(x) \le 0$

$(-\infty, 0.325] \cup [1.461, 4.214]$

EXAMPLE 4 Solving a Polynomial Inequality with Unusual Answers

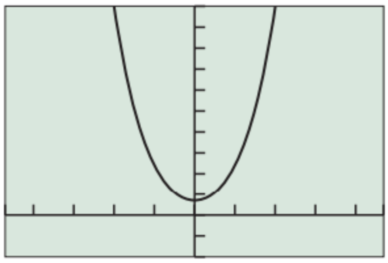
(a) The inequalities associated with the strictly positive polynomial function $f(x) = (x^2 + 7)(2x^2 + 1)$ have unusual solution sets. We use Figure 2.67a as a guide to solving the inequalities:

$f(x) > 0$ $(-\infty, \infty)$

$f(x) \geq 0$ $(-\infty, \infty)$

$f(x) < 0$ $\varnothing$

$f(x) \leq 0$ $\varnothing$



[–4.7, 4.7] by [–20, 100]

(a)

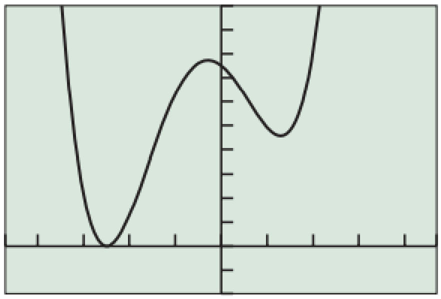
(b) The inequalities associated with the nonnegative polynomial function $g(x) = (x^2 - 3x + 3)(2x + 5)^2$ also have unusual solution sets. We use Figure 2.67b as a guide to solving the inequalities:

$g(x) > 0$ $(-\infty, \infty)$ except -2.5

$g(x) \geq 0$ $(-\infty, \infty)$

$g(x) < 0$ none $\varnothing$

$g(x) \leq 0$ $x = -2.5$



[–4.7, 4.7] by [–20, 100]

(b)

p264 # 8, 12, 16, 21