Pre-Calculus Homework #5 – Answer Key

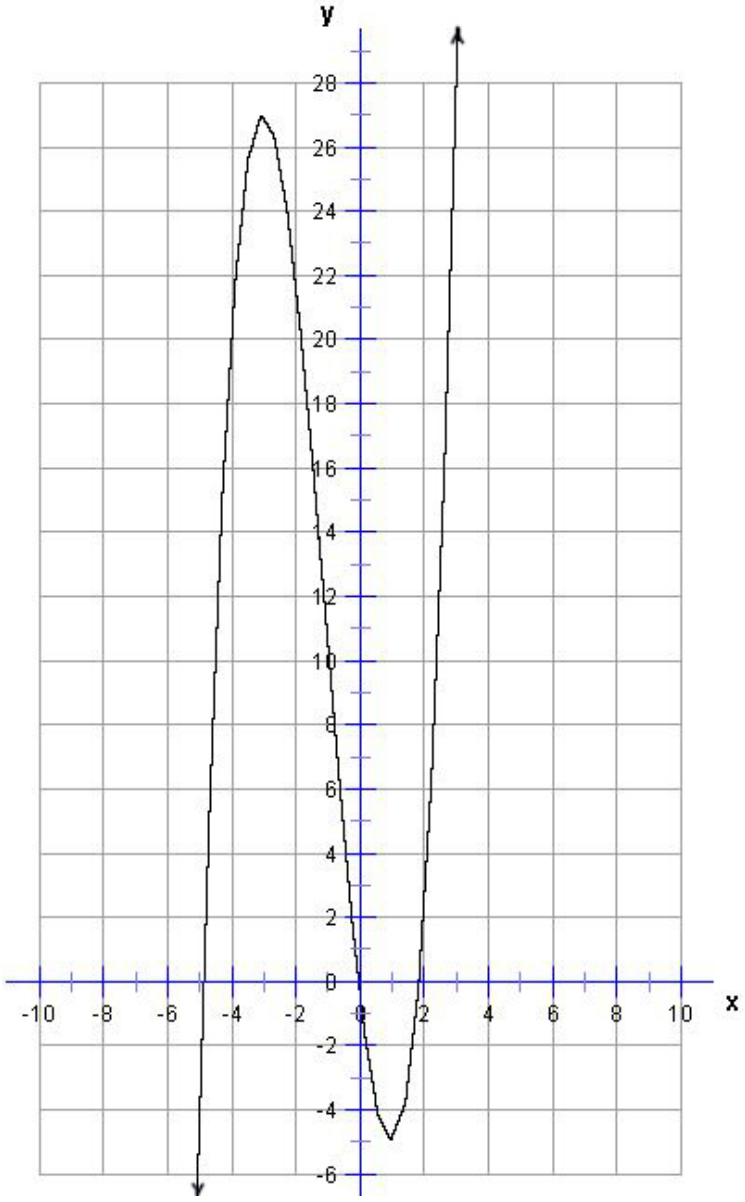
1) The relation is a function.

$f(x) = x^3 + 3x^2 - 9x$

Relative Minima: $(1, -5)$ Relative Maxima: $(-3, 27)$

Domain: All Real Numbers or $\mathbb{R}$ Range: All Real Numbers or $\mathbb{R}$

Increasing: $x < -3$ and $x > 1$ Decreasing: $-3 < x < 1$



2) $x = 0, \frac{5}{3}, \frac{-3}{4}$

3) $x = \frac{1}{16}$

4) The relation is a function.

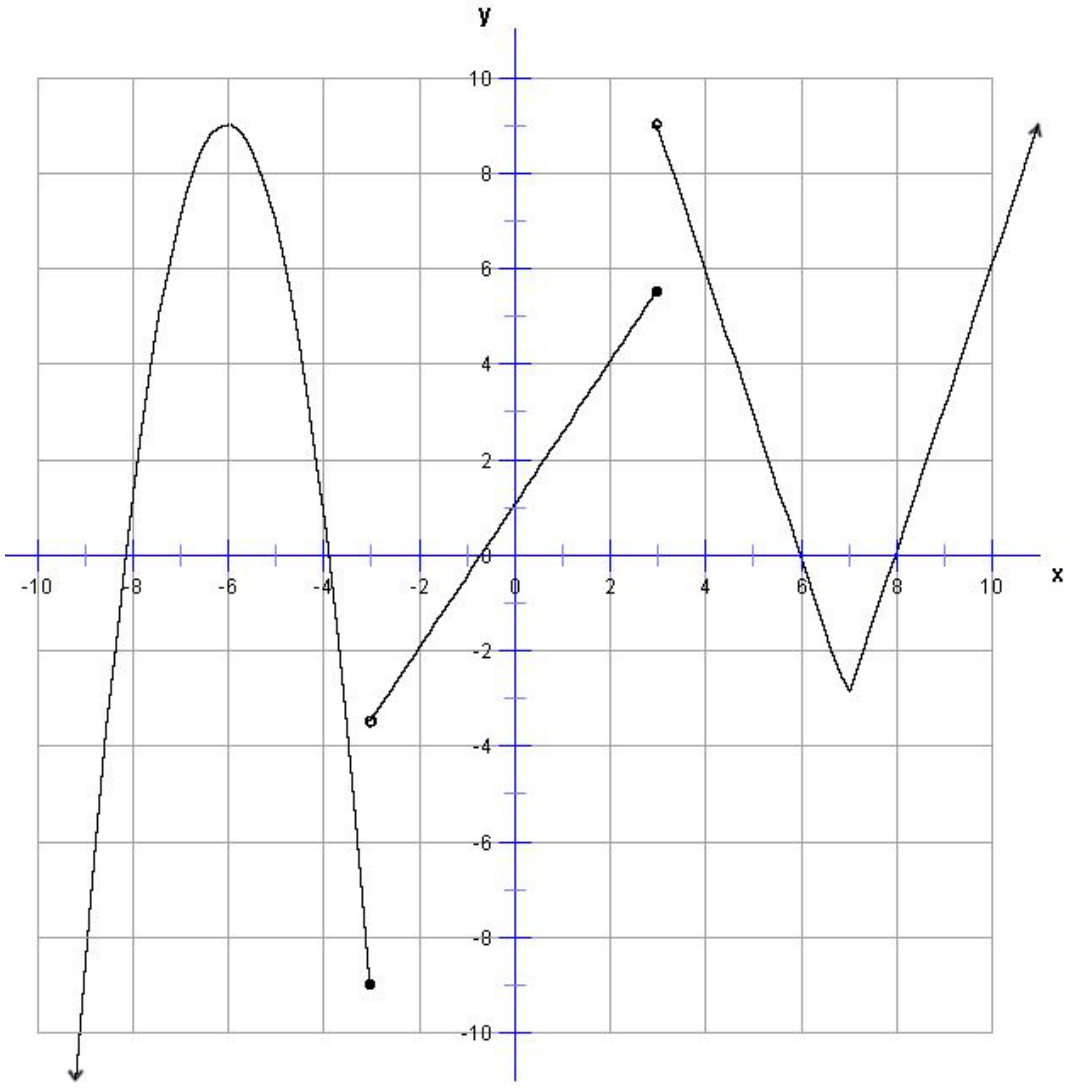
$$f(x) = \begin{cases} 3|x-7|-3 & \text{for } x > 3 \\ \frac{3}{2}x+1 & \text{for } 3 \geq x > -3 \\ -2x^2-24x-63 & \text{for } x \leq -3 \end{cases}$$

Relative Minima: $(7,-3)$ Relative Maxima: $(-6,9)$

Domain: All Real Numbers or $\mathbb{R}$ Range: All Real Numbers or $\mathbb{R}$

Increasing: $x < -6$ and $-3 < x < 3$ and $x > 7$

Decreasing: $-6 < x < -3$ and $3 < x < 7$

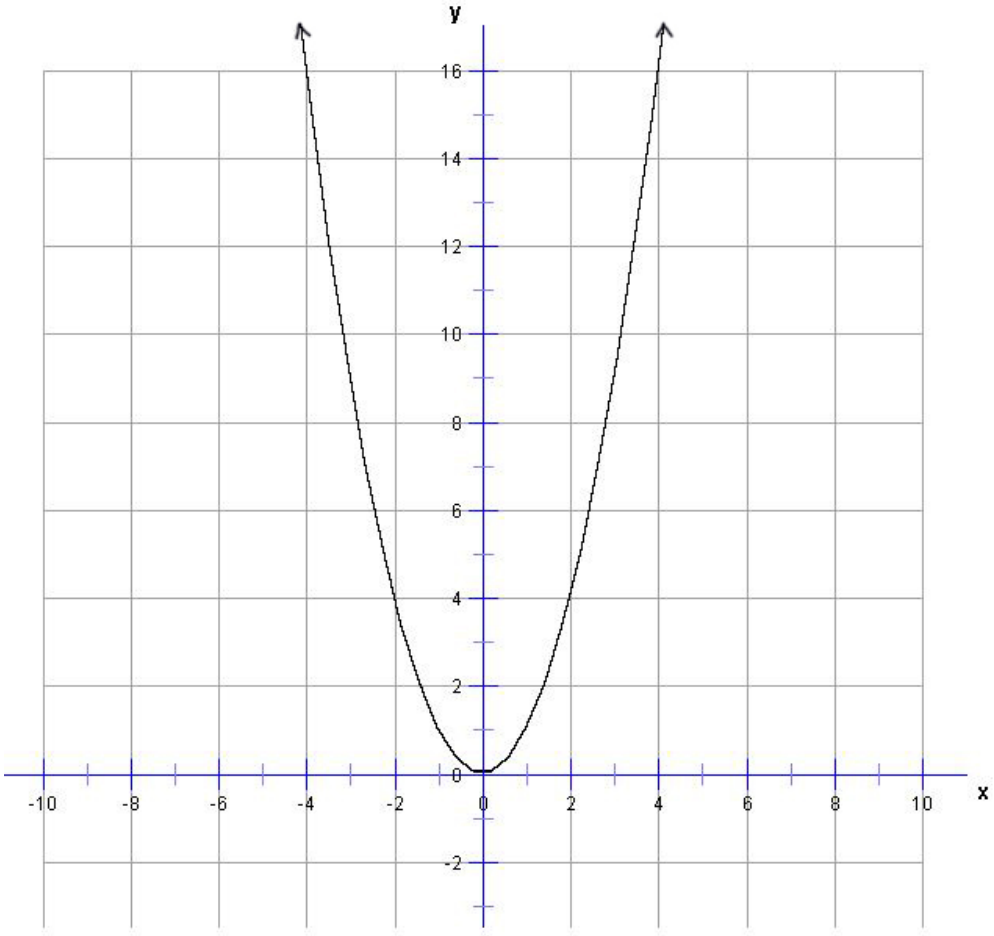


5) $x = 1, 9$

6) $(g+f)(x) = -3x^2 + x - 3$ $\qquad$ $(g \cdot f)(x) = -9x^3 + 9x^2 + 16x - 10$

$(g \circ f)(x) = -27x^2 + 84x - 63$ $\qquad$ $(g / f)(-4) = \dfrac{38}{17}$

7) Symmetric to the y axis and it is even. $\quad y = -(x+8)^2 + 7$

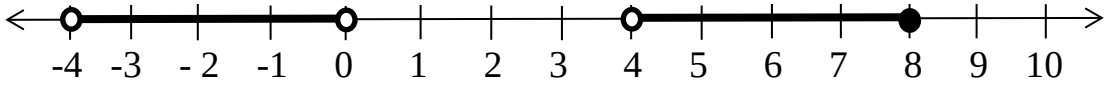


8) By Comp. the Sq.: $4(x-2)^2 = 27 \gg x = \pm\sqrt{\dfrac{27}{4}} + 2 \gg x = \dfrac{4+3\sqrt{3}}{2}, \dfrac{4-3\sqrt{3}}{2}$

By Quadratic Formula: $x = \dfrac{16 \pm \sqrt{256+176}}{8} \gg x = \dfrac{4+3\sqrt{3}}{2}, \dfrac{4-3\sqrt{3}}{2}$

9) $12x + 6h - 5$

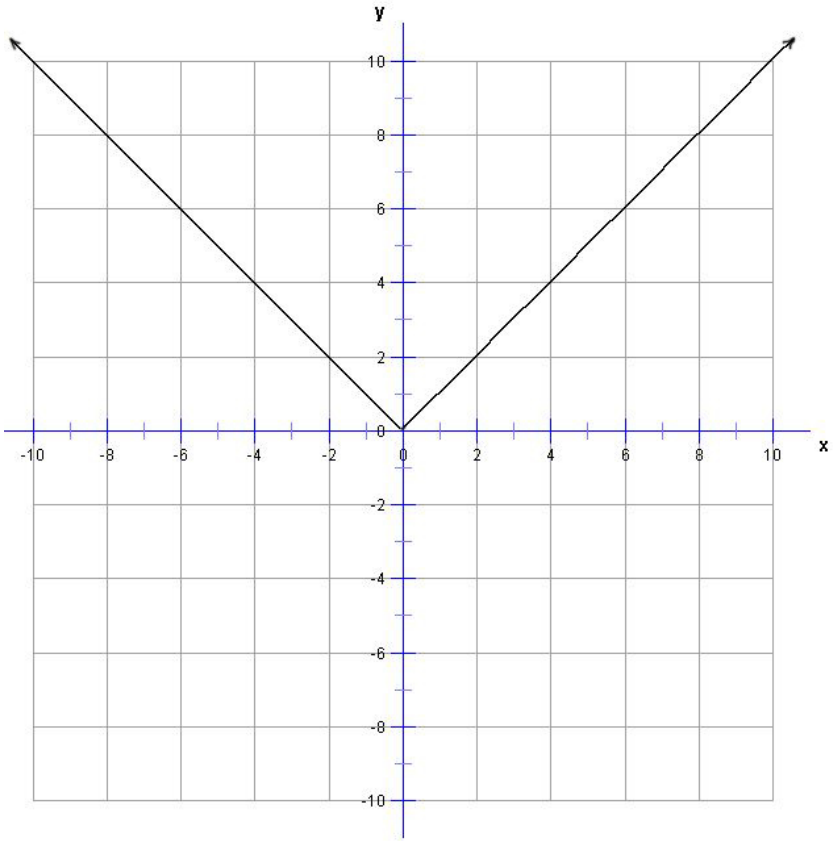
10) $-4 < x < 0$ or $4 < x \leq 8$



11) $(f-g)(x) = -3x^2 - 10x + 10$ $\quad (f \cdot g)(x) = -12x^3 - 15x^2 + 46x - 21$

$(f \circ g)(x) = -12x^2 - 24x + 31$ $\quad (f / g)(-6a) = \dfrac{24a+3}{108a^2 - 36a - 7}$

12) Symmetric to the y axis and it is even. $y = -4(x-9)^2 - 3$

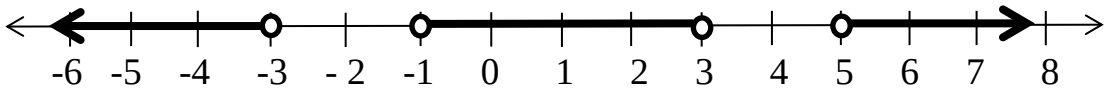


13) By Comp. the Sq.: $3(x+\frac{3}{2})^2 = \frac{55}{4} \gg x = \pm\sqrt{\frac{55}{12}} - \frac{3}{2} \gg x = \frac{-9+\sqrt{165}}{6}, \frac{-9-\sqrt{165}}{6}$

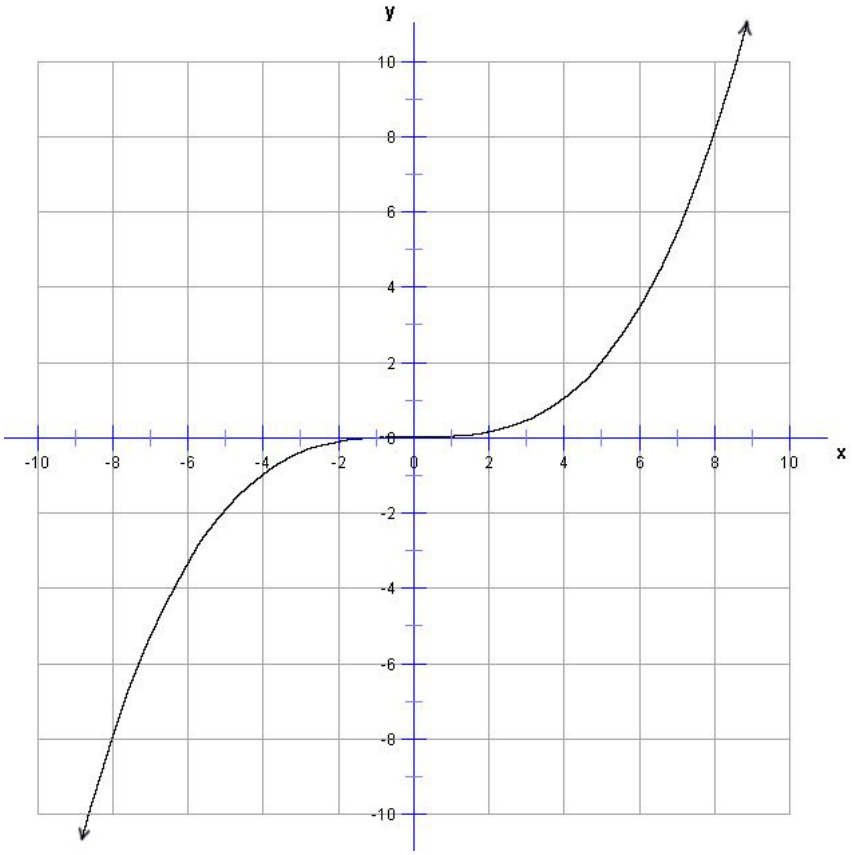
By Quadratic Formula: $x = \dfrac{-9 \pm \sqrt{81+84}}{6} \gg x = \dfrac{-9+\sqrt{165}}{6}, \dfrac{-9-\sqrt{165}}{6}$

14) $\dfrac{4x^3}{k} - 6x^2 - \dfrac{2x^2}{k} + 6xk + 2x - 2k^2 - k + \dfrac{14}{k}$

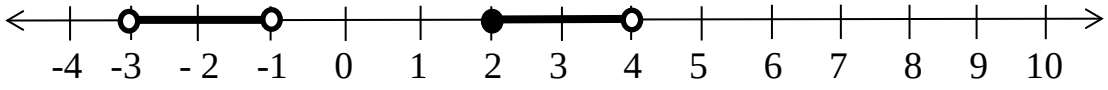
15) $x < -3$ or $-1 < x < 3$ or $x > 5$



16) Symmetric to the origin and it is odd. $y = \frac{(x+6)^3}{5} + 2$

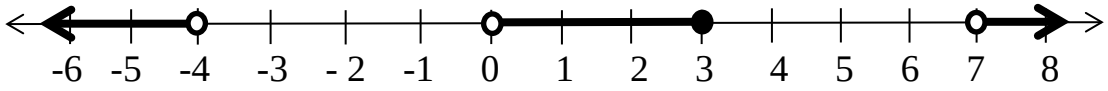


17) $-3 < x < -1$ or $2 \le x < 4$



18) $A = -2(x-40)^2 + 3200$ width = 40 length = 80 Area = 3200

19) $x < -4$ or $0 < x \le 3$ or $x > 7$



20) $y = -16x^2 + 280x + 7$ $y = -16(x - \frac{35}{4})^2 + 1232$ 8.75 seconds 1232 feet