Pre-Calculus Homework #4 – Answer Key

1) $x = \frac{52}{5}$

2) $-2x^3 - 6x^2 - 18x + 11 + \frac{25}{x-3}$

3) $6\sqrt{13}$ $\quad y = \frac{-3}{2}x + \frac{3}{2}$

4) 10

5) $x = \frac{11+\sqrt{193}}{2}, x = \frac{11-\sqrt{193}}{2}$

6) $x = 64, x = 729$

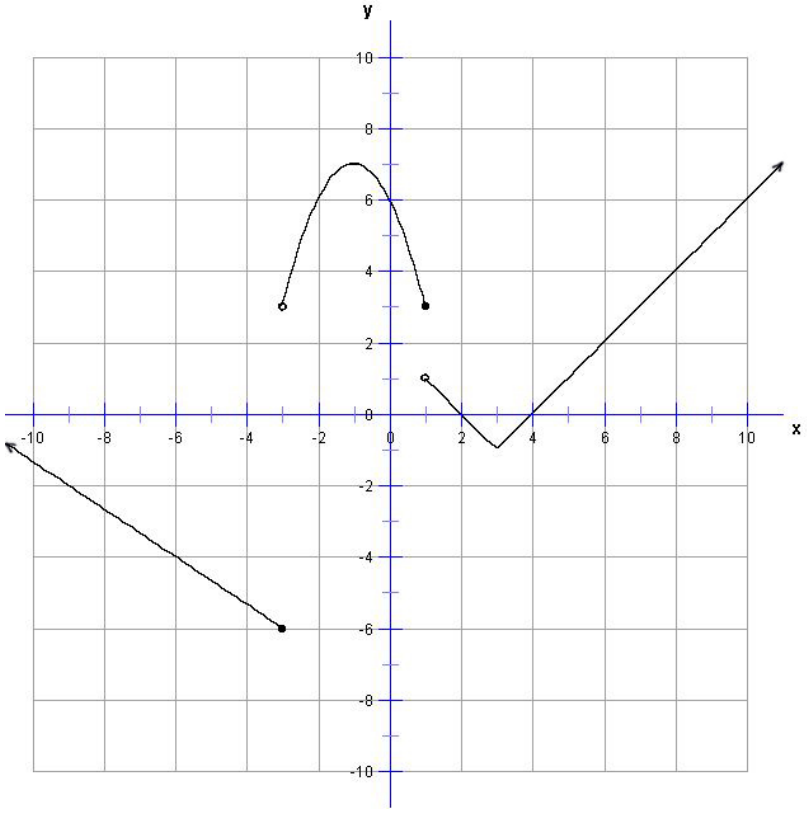
7) The relation is a function.

$$f(x) = \begin{cases} |x-3|-1 & \text{for } x > 1 \\ -x^2 - 2x + 6 & \text{for } 1 \geq x > -3 \\ \frac{-2}{3}x - 8 & \text{for } x \leq -3 \end{cases}$$

Relative Minima: $(3, -1)$ Relative Maxima: $(-1, 7)$

Domain: All Real Numbers or $\mathbb{R}$ Range: All Real Numbers ≥ -6

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



8) $x = \frac{81}{16}$

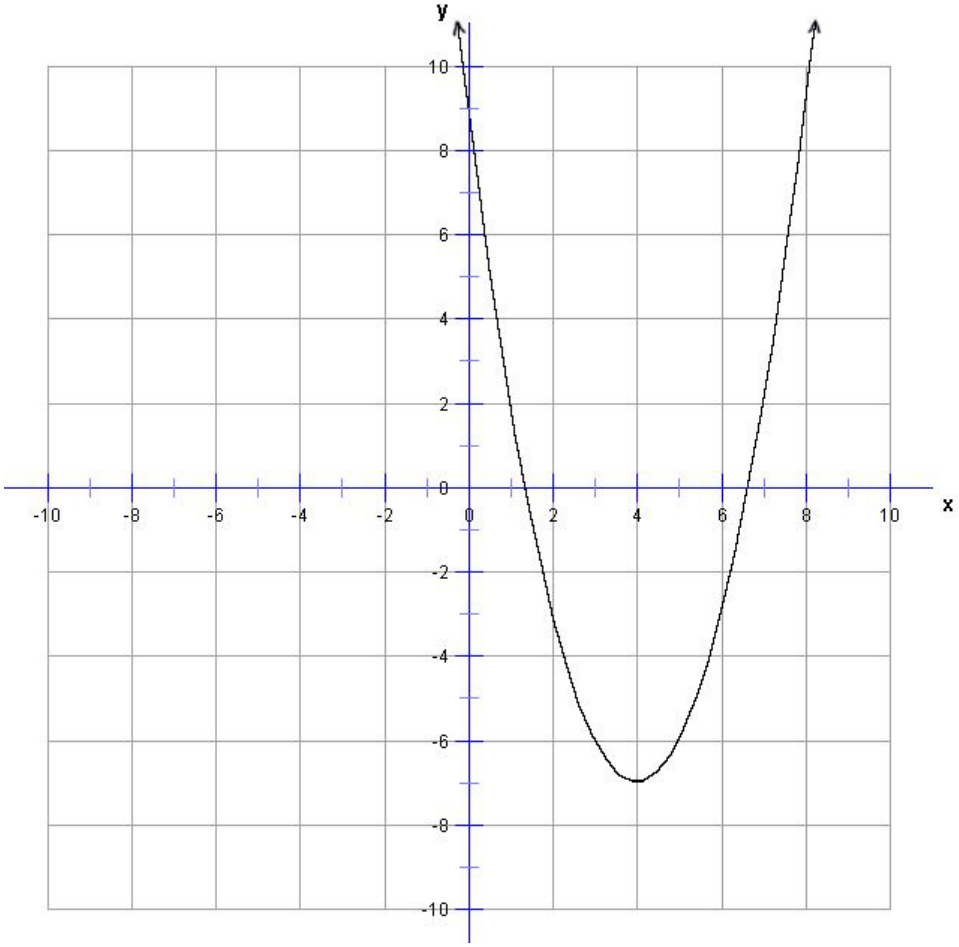
9) The relation is a function.

$f(x) = x^2 - 8x + 9$

Relative Minima: $(4, -7)$ Relative Maxima: None

Domain: All Real Numbers or $\mathbb{R}$ Range: All Real Numbers ≥ -7

Increasing: $x > 4$ Decreasing: $x < 4$



10) $x = \frac{64}{729}$

11) The relation is a function.

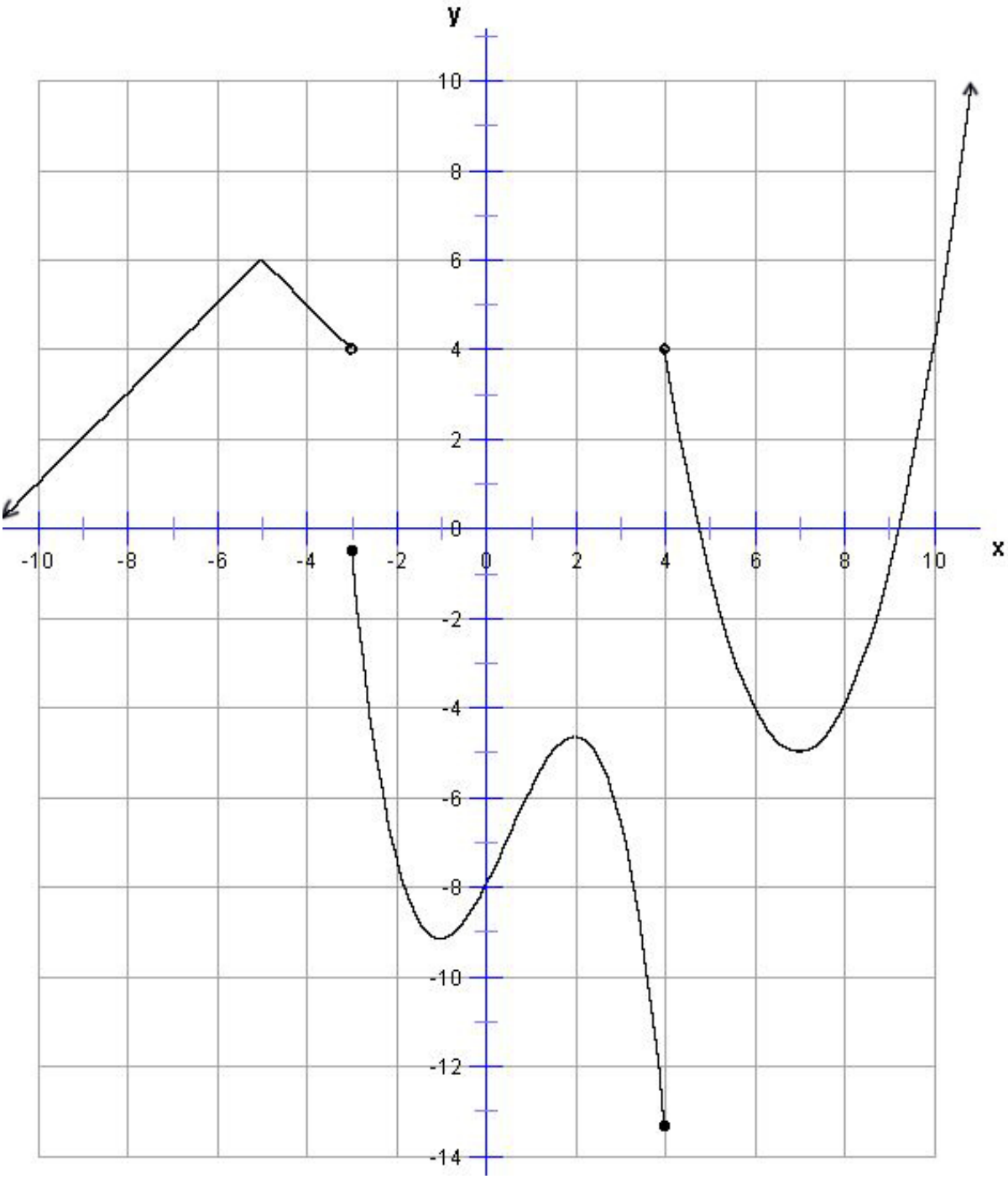
$$f(x) = \begin{cases} x^2 - 14x + 44 & \text{for } x > 4 \\ \frac{-x^3}{3} + \frac{x^2}{2} + \frac{11x}{6} - 8 & \text{for } 4 \geq x \geq -3 \\ -|x+5| + 6 & \text{for } x < -3 \end{cases}$$

Relative Minima: $(7, -5), (-1, -9)$ Relative Maxima: $(2, -5), (-5, 6)$

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

Increasing: $x < -5$ and $-1 < x < 2$ and $x > 7$

Decreasing: $-5 < x < -3$ and $-3 < x < -1$ and $2 < x < 4$ and $4 < x < 7$



12) $x = \sqrt{6}, -\sqrt{6}, i\sqrt{7}, -i\sqrt{7}$

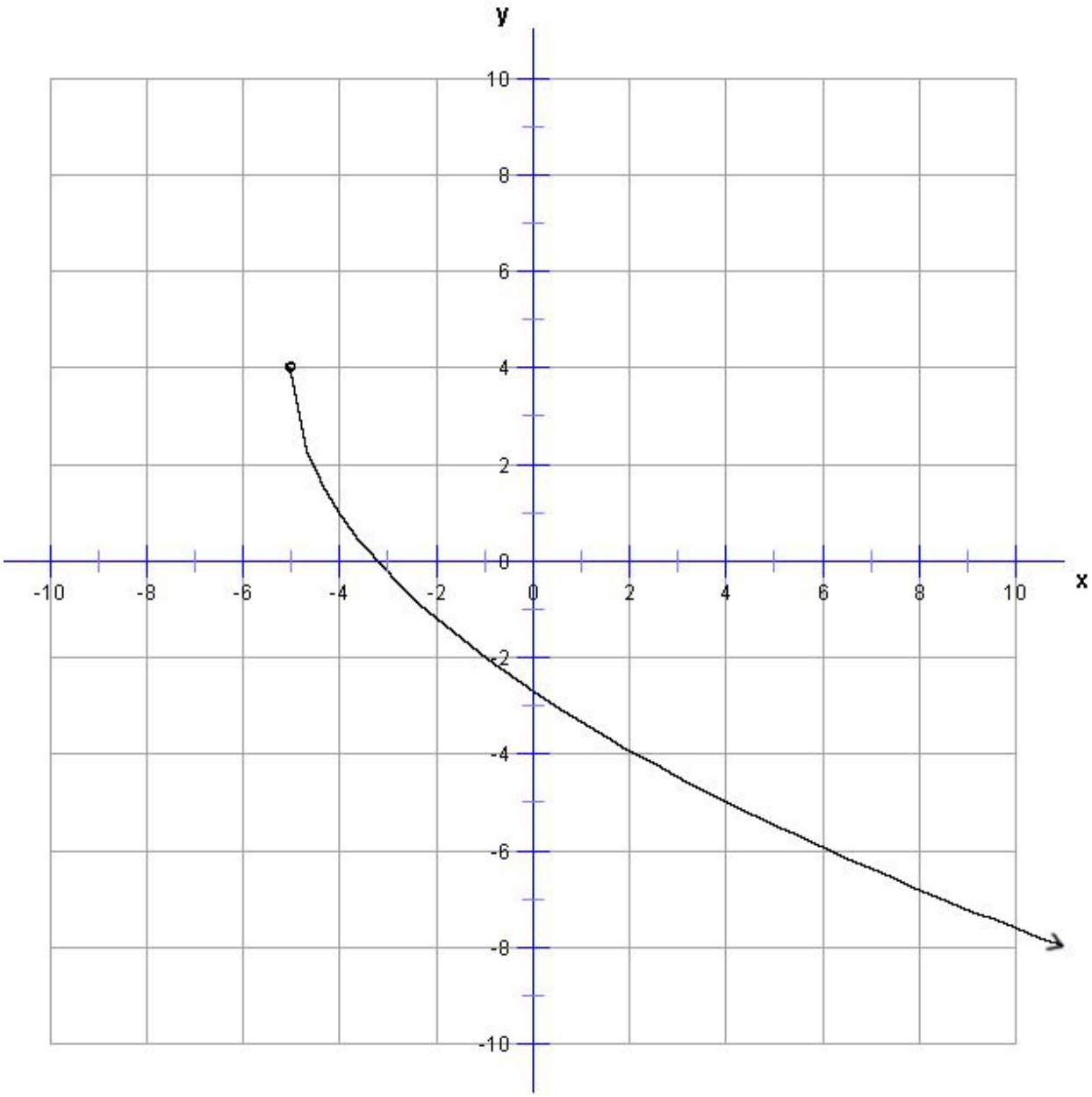
13) The relation is a function.

$f(x) = -3\sqrt{x+5} + 4$

Relative Minima: None Relative Maxima: None

Domain: All Real Numbers ≥ -5 Range: All Real Numbers ≤ 4

Increasing: Never Decreasing: $x > -5$



14) $x = 64$

15) The relation is a function.

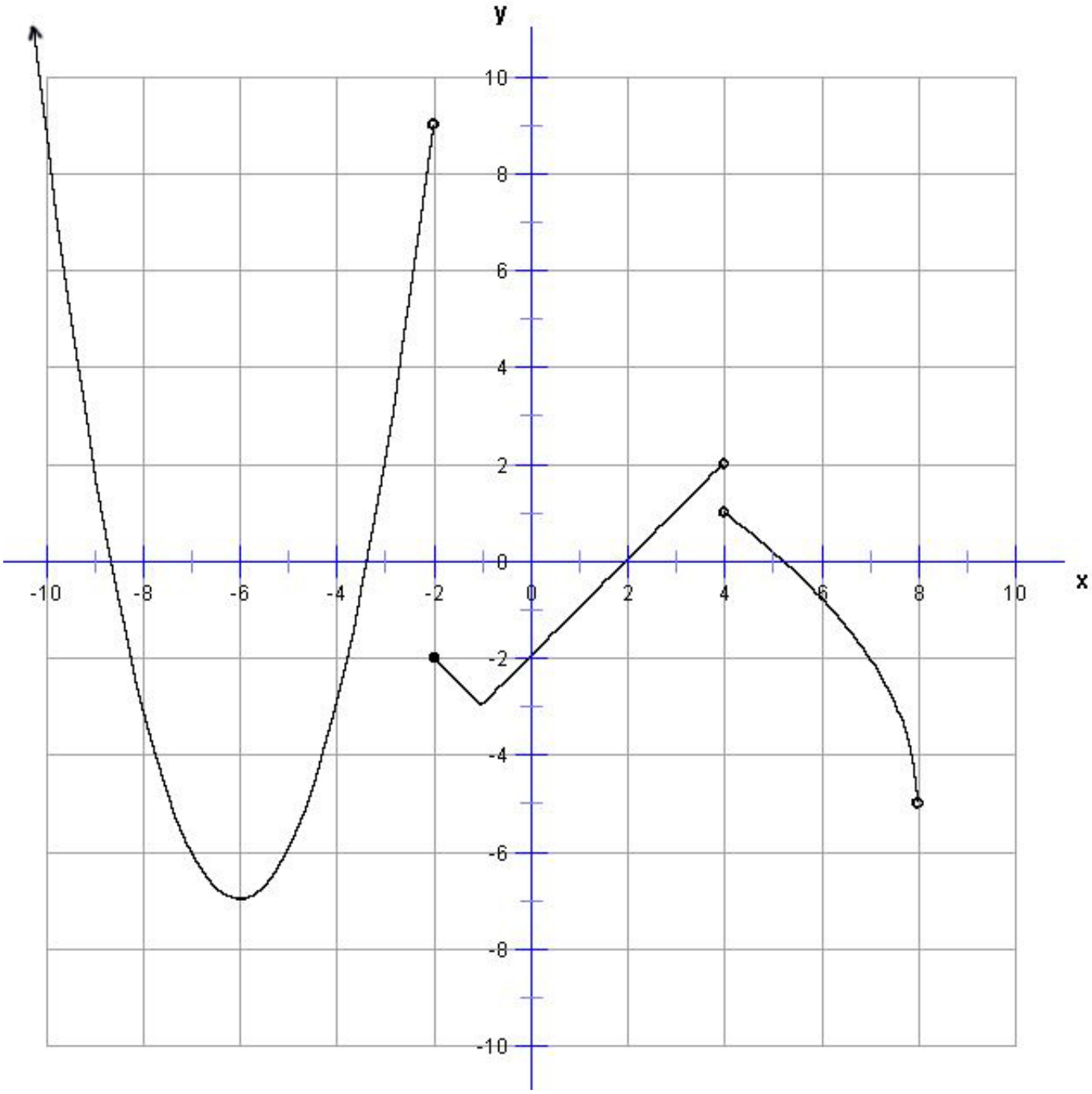
$$f(x) = \begin{cases} 3\sqrt{-x+8} - 5 & \text{for } x > 4 \\ |x+1| - 3 & \text{for } -2 \le x < 4 \\ x^2 + 12x + 29 & \text{for } x < -2 \end{cases}$$

Relative Minima: $(-6,-7),(-1,-3)$ Relative Maxima: None

Domain: All Real Numbers ≤ 8 except $x \ne 4$ Range: All Real Numbers ≥ -7

Increasing: $-6 < x < -2$ and $-1 < x < 4$

Decreasing: $x < -6$ and $-2 < x < -1$ and $4 < x < 8$



16) $x = \sqrt[3]{4}, -\sqrt[3]{3}$

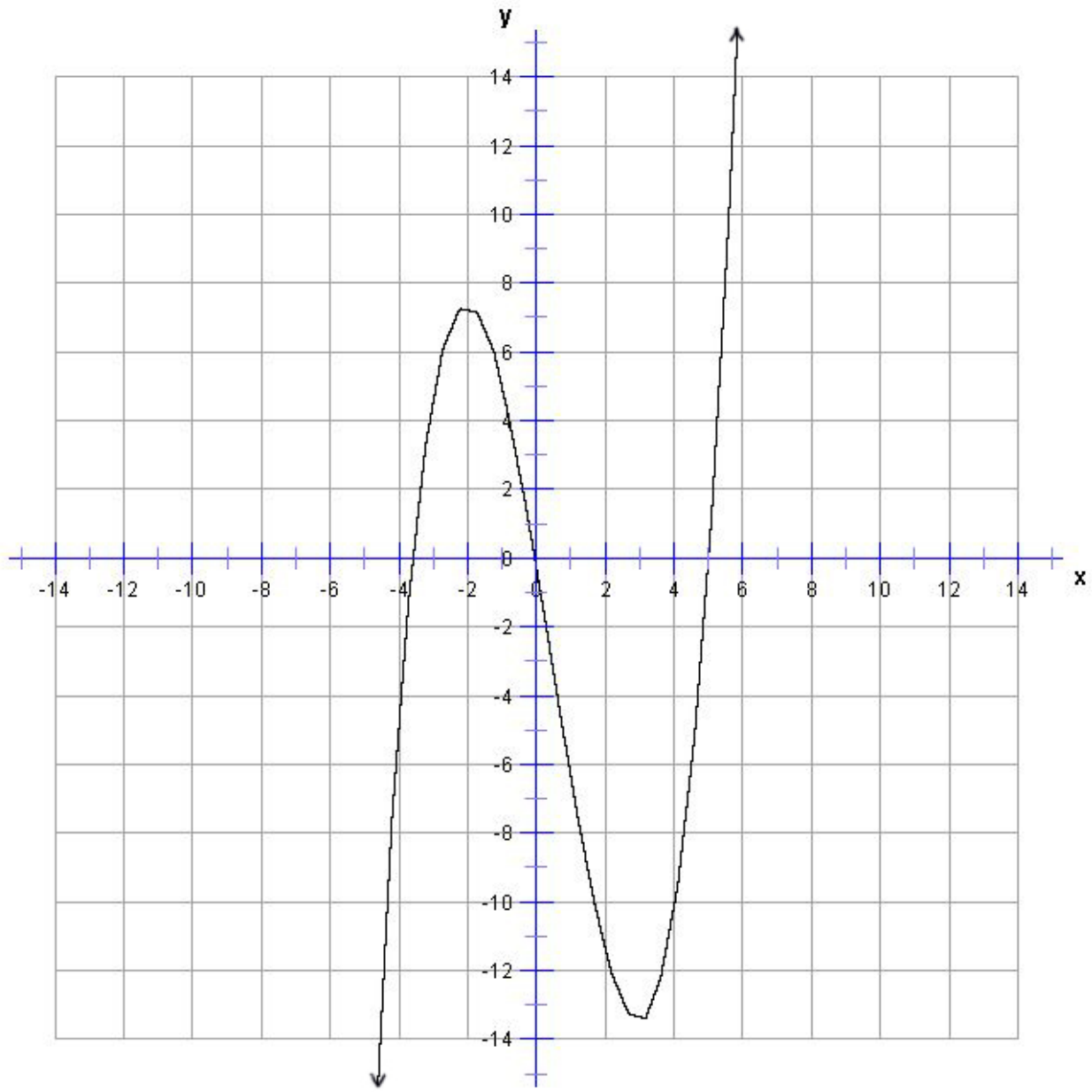
17) The relation is a function.

$f(x) = \frac{x^3}{3} - \frac{x^2}{2} - 6x$

Relative Minima: $(3, \frac{-27}{2})$ Relative Maxima: $(-2, \frac{22}{3})$

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

Increasing: $x < -2$ and $x > 3$ Decreasing: $-2 < x < 3$



18) The relation is a function.

Relative Minima: $(-8,-12),(12,-9)$ Relative Maxima: $(-14,9),(2,15)$

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

Increasing: $x<-14$ and $-8<x<2$ and $x>12$

Decreasing: $-14<x<-8$ and $2<x<12$

19) The relation is not a function.

Relative Minima: $(3,-16)$ Relative Maxima: $(3,-2)$

Domain: All Real Numbers such that $-11\le x\le 17$

Range: All Real Numbers such that $-16\le y\le -2$

20) The relation is a function.

Relative Minima: $(-4,-2)$ Relative Maxima: $(7,12)$

Domain: All Real Numbers such that $-15 \le x < 14$

Range: All Real Numbers such that $-9 < y \le 12$

Increasing: $-4 < x < 7$ Decreasing: $-15 < x < -4$ and $7 < x < 14$