

Inequality Regions

1. Shade the regions in the xy -plane which satisfy the following inequalities:

(a) $1 \leq x \leq 2$ and $-1 \leq y \leq 3$.

$$(1, -1), (2, -1), (2, 3), (1, 3)$$

(b) $x \geq 0$ and $y \geq 0$ and $y \leq -3x + 7$.

$$(0, 0), (0, 7), (\frac{7}{3}, 0)$$

(c) $x \geq 0$ and $y \geq 1$ and $2x + y \leq 8$.

$$(0, 1), (0, 8), (\frac{7}{2}, 1)$$

(d) $y \leq x$ and $y \geq -1$ and $x + y \leq 6$.

$$(-1, -1), (3, 3), (7, -1)$$

(e) $x \geq 1$ and $x + y \leq 8$ and $y \geq 2x - 3$.

$$(1, -1), (1, 7), (\frac{11}{3}, \frac{13}{3})$$

(f) $2y \geq x$ and $x + y \leq 8$ and $y \leq 2x$.

$$(0, 0), (\frac{8}{3}, \frac{16}{3}), (\frac{16}{3}, \frac{8}{3})$$

(g) $y \leq x + 6$ and $y \geq 4x + 6$ and $2x + y + 4 \geq 0$.

$$(0, 6), (-\frac{10}{3}, \frac{8}{3}), (-\frac{5}{3}, -\frac{2}{3})$$

2. Find the sets of inequalities that define the following triangles:

(a) $(1, 0)$, $(1, 5)$ and $(6, 0)$.

$$x + y \leq 6, y \geq 0, x \geq 1$$

(b) $(0, 0)$, $(0, 5)$ and $(-10, 0)$.

$$x \leq 0, y \geq 0, 2y \leq x + 10$$

(c) $(-1, -1)$, $(-2, -1)$ and $(-1, -3)$.

$$y \leq -1, x \leq -1, 2x + y + 5 \geq 0$$

(d) $(4, 5)$, $(-1, 0)$ and $(3, -1)$.

$$y \geq 6x - 19, y \leq x + 1, x + 4y + 1 \geq 0$$

(e) $(5, 1)$, $(-3, -1)$ and $(2, -3)$.

$$4y \leq x - 1, 3y \geq 4x - 17, 2x + 5y + 11 \geq 0$$

3. Find the inequality that describes the area above the line $y = 5$.

$$y > 5$$

4. Find the inequality that describes the area to the left of the line $x = -1$.

$$x < -1$$

5. Find the triple inequality that describes the area in between the lines $x = 0$ and the line $x = 7$.

$$0 < x < 7$$

6. Find the triple inequality that describes the area in between the lines $y = \frac{1}{2}$ and the line $y = 2$.

$$\frac{1}{2} < y < 2$$

7. Find the triple inequality that describes the area in between the lines $x = \pi$ and the line $x = 2\pi$.

$$\pi < x < 2\pi$$

8. Find the two triple inequalities that describe the interior of the rectangle formed by the points $(-1, 3)$, $(-1, 5)$, $(2, 5)$ and $(2, 3)$.

$$-1 < x < 2 \text{ and } 3 < y < 5$$

9. Find the two triple inequalities that describe the interior of the rectangle formed by the points $(1, 0)$, $(1, 4)$, $(4, 4)$ and $(4, 0)$.

$$1 < x < 4 \text{ and } 0 < y < 4$$

10. Find the two triple inequalities that describe the interior of the rectangle formed by the points $(\frac{1}{3}, -1)$, $(\frac{1}{3}, 2)$, $(\frac{5}{2}, 2)$ and $(\frac{5}{2}, -1)$.

$$\frac{1}{3} < x < \frac{5}{2} \text{ and } -1 < y < 2$$

11. Find the inequalities that describe the interior of the triangle formed by the points $(0, 0)$, $(2, 0)$ and $(0, 2)$.

$$x > 0 \text{ and } y > 0 \text{ and } x + y < 2$$

12. Find the inequalities that describe the interior of the triangle formed by the points $(0, 0)$, $(3, 0)$ and $(0, -3)$.

$$x > 0 \text{ and } y < 0 \text{ and } y > x - 3$$

13. Find the inequalities that describe the interior of the triangle formed by the points $(0, 0)$, $(-4, 0)$ and $(0, -4)$.

$$x < 0 \text{ and } y < 0 \text{ and } x + y + 4 > 0$$

14. Find the inequalities that describe the interior of the triangle formed by the points $(0, 0)$, $(2, 0)$ and $(0, 4)$. $x > 0$ and $y > 0$ and $2x + y < 4$
15. Find the inequalities that describe the interior of the triangle formed by the points $(0, 0)$, $(0, 1)$ and $(-3, 0)$. $x < 0$ and $y > 0$ and $3y < x + 3$
16. Find the inequalities that describe the interior of the triangle formed by the points $(1, 1)$, $(5, 1)$ and $(5, 3)$. $x < 5$ and $y > 1$ and $2y < x + 1$
17. Find the inequalities that describe the interior of the triangle formed by the points $(2, 3)$, $(4, 3)$ and $(3, 4)$. $y > 3$ and $x + y < 7$ and $y < x + 1$
18. Find the inequalities that describe the interior of the triangle formed by the points $(-2, 3)$, $(2, 3)$ and $(0, 2)$. $y < 3$ and $2y > x + 4$ and $x + 2y > 4$
19. HARDER. Shade the following regions:
- (a) $1 \leq xy \leq 2$.