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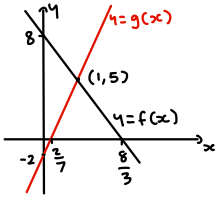
3.6 Inequalities on graphs

1.

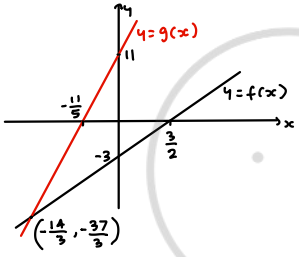
a) i)



$8-3x=7x-2$
$10x=10$
$x=1,\ y=5$
The lines intersect at (1,5)

ii) $f(x)<g(x)$ when the $f(x)$ is below $g(x)$
so $x>1$

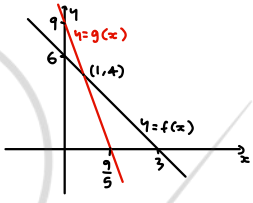
b) i)



$2x-3=5x+11$
$3x=-14$
$x=-\frac{14}{3},\ y=-\frac{37}{3}$
The lines intersect at $\left(-\frac{14}{3},-\frac{37}{3}\right)$

ii) $f(x)<g(x)$ when the $f(x)$ is below $g(x)$
so $x>-\frac{14}{3}$

c)

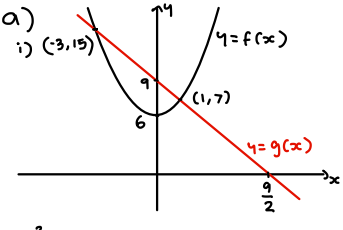


$6-2x=9-5x$
$3x=3$
$x=1,\ y=4$
The lines intersect at (1,4)

ii) $f(x)<g(x)$ when the $f(x)$ is below $g(x)$
so $x<1$

2.

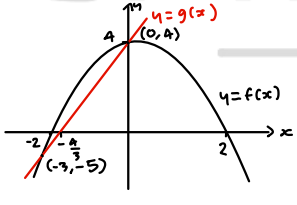
a)



$x^2+6=-2x+9$
x^2+2x-3
$x=1$ or $x=-3$
When $x=1,\ y=7$
When $x=-3,\ y=15$
The lines intersect at (1,7) and (-3,15)

ii) $f(x)\leq g(x)$ when $f(x)$ is below $g(x)$ so
$-3\leq x\leq 1$

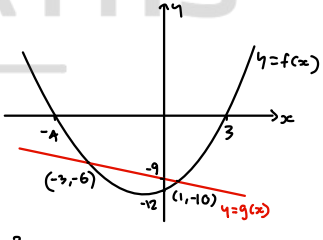
b) i)



$4-x^2=3x+4$
$-x^2-3x=0$
$x=0$ or $x=-3$
When $x=0,\ y=4$
When $x=-3,\ y=-5$
The lines intersect at (0,4) and (-3,-5)

ii) $f(x)\leq g(x)$ when $f(x)$ is below $g(x)$ so
$x\leq -3$ and $x\geq 0$

c) i)

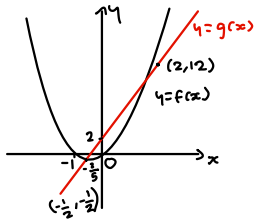


$x^2+x-12=-x-9$
$x^2+2x-3=0$
$x=1$ or $x=-3$
When $x=1,\ y=-10$
When $x=-3,\ y=-6$
The lines intersect at (1,-10) and (-3,-6)

ii) $f(x)\leq g(x)$ when $f(x)$ is below $g(x)$ so
$-3\leq x\leq 1$

3.

a) i)



$2x^2+2x=5x+2$

$2x^2-3x-2=0$

$x=2$ or $x=-\frac{1}{2}$

When $x=2$, $y=12$

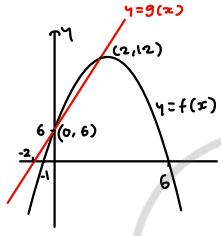
When $x=-\frac{1}{2}$, $y=-\frac{1}{2}$

The lines intersect at $(2,12)$ and $(-\frac{1}{2},-\frac{1}{2})$

ii) $f(x)>g(x)$ when $f(x)$ is above $g(x)$ so

$\{x: x<-0.5\} \cup \{x: x>2\}$

b) i)



$-x^2+5x+6=3x+6$

$-x^2+2x=0$

$x=2$ or $x=0$

When $x=2$, $y=12$

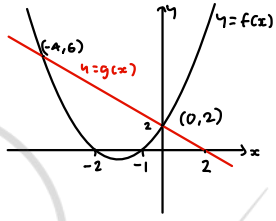
When $x=0$, $y=6$

The lines intersect at $(2,12)$ and $(0,6)$

ii) $f(x)>g(x)$ when $f(x)$ is above $g(x)$ so

$\{x: 0<x<2\}$

c) i)



$x^2+3x+2=2-x$

$x^2+4x=0$

$x=0$ or $x=-4$

When $x=0$, $y=2$

When $x=-4$, $y=6$

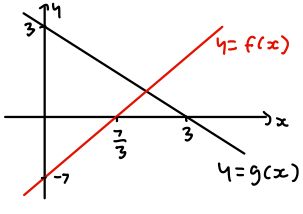
The lines intersect at $(0,2)$ and $(-4,6)$

ii) $f(x)>g(x)$ when $f(x)$ is above $g(x)$ so

$\{x: x<-4\} \cup \{x: x>0\}$

4.

a)



b) $3x-7=3-x$

$4x=10$

$x=\frac{5}{2}$, $y=\frac{1}{2}$

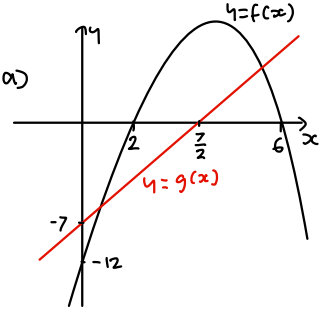
The lines intersect at $(\frac{5}{2},\frac{1}{2})$

c) $f(x)>g(x)$ when $f(x)$ is above $g(x)$ so

$x>\frac{5}{2}$

5.

a)



b) $8x-12-x^2=2x-7$

$6x-5-x^2=0$

$-x^2+6x-5=0$

$x=5$ or $x=1$

when $x=5$, $y=3$

when $x=1$, $y=-5$

The lines intersect at $(5,3)$ and $(1,-5)$

c) $f(x)>g(x)$ when $f(x)$ is above $g(x)$ so

$1<x<5$

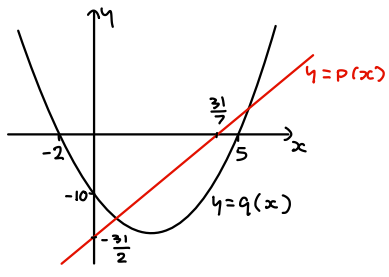
6. $p(x) = \frac{7}{2}x - \frac{31}{2}$, $q(x) = x^2 - 3x - 10$

a) $x^2 - 3x - 10 = 0$

$(x-5)(x+2) = 0$

$x = 5$ and $x = -2$

b)



c) $\frac{7}{2}x - \frac{31}{2} = x^2 - 3x - 10$

$x^2 - \frac{13}{2}x + \frac{11}{2} = 0$

$x = \frac{11}{2}$ or $x = 1$

When $x = \frac{11}{2}$, $y = \frac{15}{4}$

When $x = 1$, $y = -12$

The lines intersect at $(\frac{11}{2}, \frac{15}{4})$ and $(1, -12)$

d) $p(x) < q(x)$ when $p(x)$ is below $q(x)$

so $\{x : x < 1\} \cup \{x : x > \frac{11}{2}\}$