2.8 Inequalities

Question Paper

Course	DP IB Maths
Section	2. Functions
Topic	2.8 Inequalities
Difficulty	Medium

Time allowed: 70

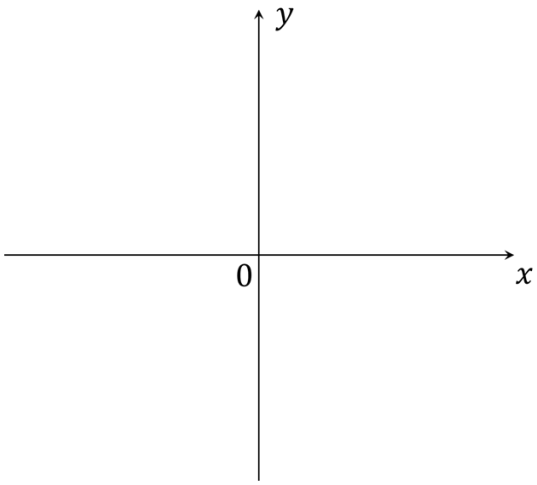
Score: /58

Percentage: /100

Question 1a

Consider the functions $f(x) = 3x^2 + x - 2$ and $g(x) = -2x^2 + 3x + 5$.

a)
Sketch the graph of the function $f(x)$ on the axes provided, labelling the vertex as well as the x- and y-intercepts.



[3 marks]

Question 1b

b)
Solve the inequality $f(x) < g(x)$.

[4 marks]

Question 2

Solve the inequality $5x^2 - 8x - 48 \geq 2x^2 + 4x - 12$.

[4 marks]

Question 3a

Consider the inequality $\frac{x^2 - 3x - 10}{x - 1} < 0$.

a)
Explain why you need to consider the cases $x < 1$, $x = 1$ and $x > 1$ separately when rearranging the inequality to find a solution.

[2 marks]

Question 3b

b)
Solve the inequality.

[5 marks]

Question 4a

The functions and are defined such that $f(x) = \frac{x+4}{2x-1}$ and $g(x) = 2x - 4$.

Given that f has the largest possible valid domain,

a)
State the domain and range of f.

[2 marks]

Question 4b

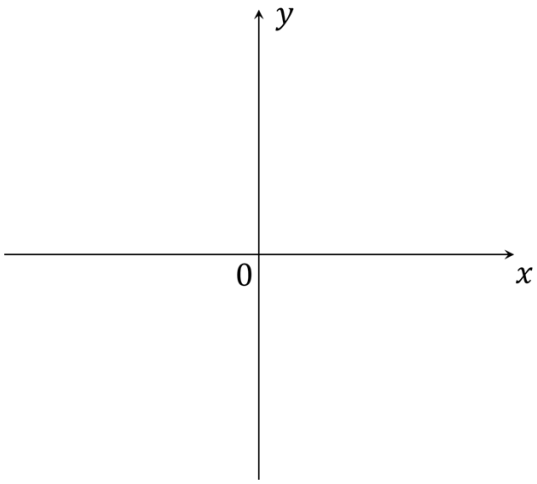
b)
Solve the inequality $f(x) \leq g(x)$.

[4 marks]

Question 5a

Consider the function $f(x) = -2\sin x$ in the interval $-2\pi \leq x \leq 2\pi$.

a)
Sketch a graph of the function over the given interval on the axes provided, labelling all x-intercepts as well as local minima and maxima.



[3 marks]

Question 5b

b)
Solve the inequality $f(x) > 1$.

[4 marks]

Question 6

Solve the inequality $\frac{3x-2}{5}+3>\frac{4x-4}{5}$

[4 marks]

Question 7a

Consider the functions $f(x)=x^2-9+\frac{4}{x}$ and $g(x)=-x+5$.

a)
Sketch the graphs of $f(x)$ and $g(x)$, clearly labelling any points of intersection or asymptotes.

[4 marks]

Question 7b

b)

Determine the values of x such that $f(x) \geq g(x)$.

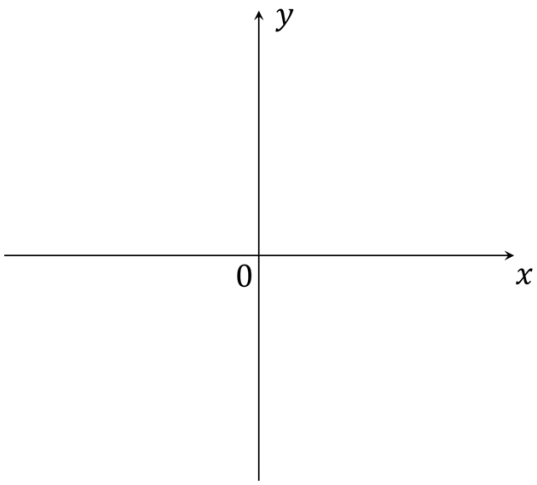
[3 marks]

Question 8a

Consider two functions, $f(x) = \ln(x+3) + 4$ and $g(x) = e^{x-3}$.

a)

Sketch both functions on the axes below, clearly labelling the asymptotes and points of intersection.



[4 marks]

Question 8b

b)
Hence or otherwise, solve the inequality $f(x) \geq g(x)$.

[2 marks]

Question 9a

Consider the polynomial $q(x) = x^3 - 8x^2 + 19x - 12$.

a)
Given that $(x - 4)$ is a factor of $q(x)$, determine the x-intercepts of $q(x)$.

[4 marks]

Question 9b

b)
Hence or otherwise, solve the inequality $x^3 + 19x \leq 8x^2 + 12$.

[3 marks]

Question 10

Consider the two functions $f(x) = 2\sin 2x$ and $g(x) = \cos x$, both having the domain $0 \leq x \leq 2\pi$.

Solve the inequality $f(x) \geq g(x)$.

[3 marks]