

CURVE SKETCHING AND INEQUALITIES

1) For each of the following functions, sketch the graphs of $y = f(x)$ and solve the inequality $f(x) \geq 0$.

a) $f(x) = (x - 1)(x + 4)(x - 6)$,

b) $f(x) = x(x - 2)^2$,

c) $f(x) = (x + 1)^3$,

d) $f(x) = (x + 3)(3 - x)^2$,

e) $f(x) = (2x - 3)(x + 5)x$,

f) $f(x) = (3x + 1)^2(x - 4)$,

g) $f(x) = (2 - x)(x + 3)^2$,

h) $f(x) = (x - 2)^2(5 + x)$,

i) $f(x) = (5 - 2x)(5 - x)(x + 1)$,

j) $f(x) = (3 - x)^3$,

k) $f(x) = x^4$,

l) $f(x) = (x - 1)^4$,

m) $f(x) = (x + 1)^3(4 - x)$,

n) $f(x) = (x + 2)^2(x - 1)(4 - x)$,

o) $f(x) = (x - 2)^2(x + 2)^2$,

p) $f(x) = (x + 4)(x - 3)(x - 1)x$.

2) Factorise the expression $2x^2 + 5x - 3$ and hence sketch the graph of $y = 2x^2 + 5x - 3$. Solve the inequality $2x^2 + 5x > 3$.

3) Sketch the graph of $y = x^2 + 4x - 12$ and hence solve the inequality $2x^2 + 5x < x^2 + x + 12$.

4) Draw sketch graphs to solve each of the following inequalities:

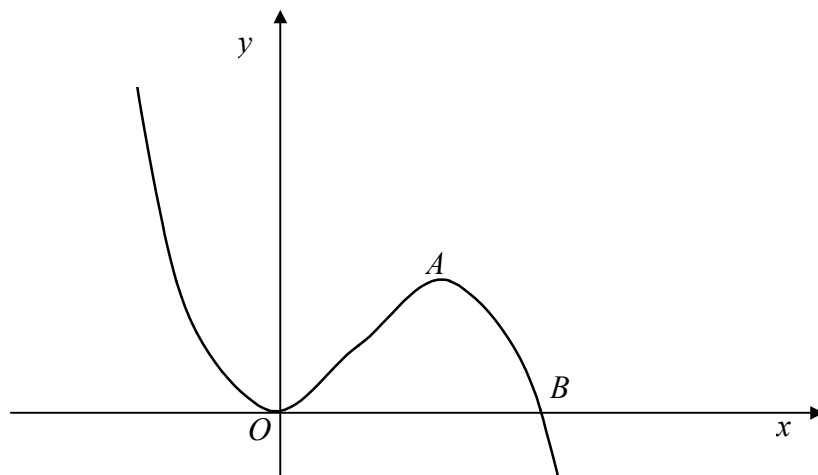
a) $x^2 + 6x + 8 > 3$,

b) $3x^2 + 4x \leq x^2 - x + 3$.

5) Factorise the expression $2x^2 - 3x - 5$.

Hence solve the equation $2x^3 - 3x^2 - 5x = 0$ and thus sketch the graph of $y = 2x^3 - 3x^2 - 5x$.

*6)



The diagram shows the graph of $y = x^2(3 - x)$. The coordinates of the points A and B on the graph are $(2, 4)$ and $(3, 0)$ respectively.

i) Write down the solution set of the inequality $x^2(3 - x) \geq 0$.

ii) The equation $x^2(3 - x) = k$ has three solutions for x . Write down the set of possible values for k .

ANSWERS.

- 1) a) $-4 \leq x \leq 1$ or $x \geq 6$.
b) $x \geq 0$.
c) $x \geq -1$.
d) $x \geq -3$.
e) $-5 \leq x \leq 0$ or $x \geq 1.5$.
f) $x \geq 4$.
g) $x \leq 2$.
h) $x \geq -5$.
i) $-1 \leq x \leq 2.5$, or $x \geq 5$.
j) $x \leq 3$.
k) any value of x .
l) any value of x .
m) $-1 \leq x \leq 4$.
n) $1 \leq x \leq 4$.
o) any value of x .
p) $x \leq -4$ or $0 \leq x \leq 1$ or $x \geq 3$.
- 2) $2x^2 + 5x - 3 = (2x - 1)(x + 3)$. $x < -3$ or $x > 0.5$.
- 3) $-6 < x < 2$.
- 4) a) $x < -5$ or $x > -1$, b) $-3 \leq x \leq 0.5$.
- 5) $2x^2 - 3x - 5 = (2x - 5)(x + 1)$. $x = 0$ or $x = -1$ or $x = 2.5$.
- 6) i) $x \leq 3$, ii) $0 < k < 4$.