SQP Paper 1

1

*See **Differentiation** §2*

$$y = \frac{x^3 - x}{x^2} = \frac{x^3}{x^2} - \frac{x}{x^2} = x - x^{-1}.$$

$$\frac{dy}{dx} = 1 + x^{-2} = 1 + \frac{1}{x^2}.$$

Remember:
$$\frac{x^a}{x^b} = x^{a-b}.$$

B

2

*See **Functions and Graphs** §3*

$$g(f(x)) = g(2x-3) = (2x-3)^2 = 4x^2 - 12x + 9.$$

A

3

*See **Integration** §1 and §2*

$$\int \frac{1}{\sqrt[3]{x}}\,dx = \int x^{-1/3}\,dx$$
$$= \frac{x^{2/3}}{2/3} + c$$
$$= \frac{3}{2}x^{2/3} + c$$

Remember:
$$\frac{a}{b/c} = a \times \frac{c}{b}$$

C

4

*See **Vectors** §3*

$$d_{AB}^2 = (2-(-1))^2 + (3-(-4))^2 + (-2-0)^2$$
$$= 3^2 + 7^2 + (-2)^2$$
$$= 9 + 49 + 4$$
$$= 62.$$

So $d_{AB} = \sqrt{62}$.

C

SQP

5

See **Sequences** §1 and §2

$u_0 = -1$

$u_1 = 3u_0 - 4 = 3 \times (-1) - 4 = -3 - 4 = -7.$

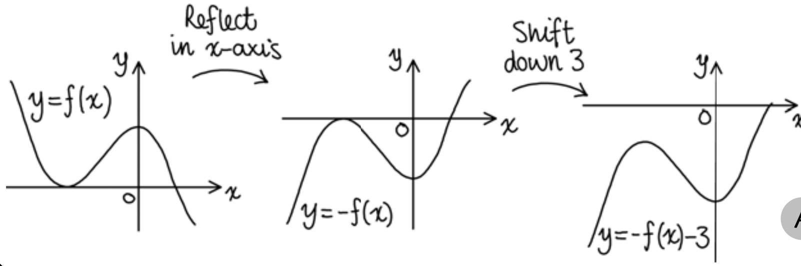
$u_2 = 3u_1 - 4 = 3 \times (-7) - 4 = -21 - 4 = -25.$

A

6

See **Functions and Graphs** §10

$y = -3 - f(x) = -f(x) - 3.$



A

7

See **Polynomials and Quadratics** §3 and §1

The turning point is $(4, -5)$.
Since the x^2 coefficient is $3 > 0$, the parabola is concave up, i.e. U-shaped.
So the turning point is a minimum.

Remember:
The parabola $y = a(x-p)^2 + q$ has turning point (p, q).

C

8

See **Trigonometry** §4

$\sin 2x° = 2\sin x° \cos x°$

$= 2 \times \frac{2\sqrt{2}}{3} \times \frac{1}{3}$

$= \frac{4\sqrt{2}}{9}$

$\sin x° = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{2\sqrt{2}}{3}$

$\cos x° = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{1}{3}.$

A

SQP Paper 2

1

See **Straight Lines** (a) §7, (b) §8, (c) §10, (d) §3

a $N = \text{midpoint}_{AB} = \left(\frac{2+10}{2}, \frac{1+1}{2}\right) = (6,1)$.

$m_{CN} = \frac{1-7}{6-4} = \frac{-6}{2} = -3$.

So the equation is $y-1 = -3(x-6)$ using $N(6,1)$

$y-1 = -3x+18$

$3x+y-19=0$.

b $m_{BC} = \frac{7-1}{4-10} = \frac{6}{-6} = -1$. So $m_{AD} = 1$ since $AD \perp BC$.

(i.e. $m_{BC} \times m_{AD} = -1$)

So the equation is $y-1 = 1(x-2)$ using $A(2,1)$.

$x-y-1=0$.

c Solve simultaneously...

Method 1 Eliminating y:

$3x+y-19=0$ —— ①

$x-y-1=0$ —— ②

①+②: $4x-20=0$

$x=5$

Method 2 Rearrange both equations for y and equate:

$19-3x = x-1$

$4x = 20$

$x = 5$

When $x=5$, $y=5-1=4$. So P has coordinates $(5,4)$.

d $m_{PQ} = \frac{1-4}{8-5} = \frac{-3}{3} = -1 = m_{BC}$ from part (b).

So PQ and BC are parallel.

SQP