



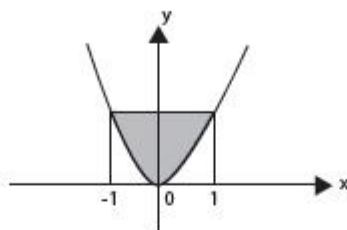
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# HSC MATHEMATICS

## INTERGRATION - Worksheet 4

### QUESTION 7

Find the area of shaded region (The curve is  $y = x^2$ )



### QUESTION 8

Find the area bounded by the curves  $x = y^2$  &  $x = y^{1/2}$  about the y-axis (HINT: P sketch the curves & identify the shaded region)

### QUESTION 9

- Find the points of intersection between the line  $y = x$  with the parabola  $y = (x-2)^2$
- Find the area enclosed between this line & the given parabola

### QUESTION 10

Find the area enclosed by the curve  $y = x^3 + 4$ , the lines  $y = 1$  &  $y = 2$

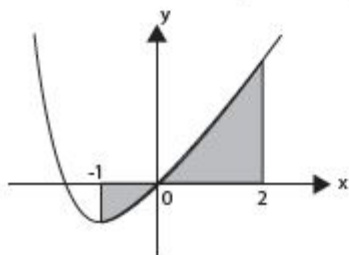
### QUESTION 11

Find the areas bounded by

- The line  $y = x + 1$  with the parabola  $y = 2x^2$
- The curve  $y^2 = 4x$ , the x-axis & the line  $x = 2$

### QUESTION 12

Find the area enclosed by the curve  $y = x(x+2)$ , the x-axis & the lines  $x = -1$  &  $x = 2$





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## QUADRATIC FUNCTIONS - Worksheet 1

### Sketching quadratic functions by finding the key features

1. Sketch the following showing all the key features

a.  $y = x^2 + 2x$ .

b.  $y = 4x^2 - 3x + 1$ .

c.  $y = -x^2 + 2x - 7$ .

d.  $y = x^2 + 3x + 2$ .

e.  $y = -2x^2 - 4x + 5$

f.  $y = x^2 - 4$ .

2. Find the minimum value of the following quadratic functions and how many solutions the equation has (HINT: to find solutions set the quadratic equal to 0)

a.  $y = x^2 + 4x + 3$ .

b.  $y = x^2 + x + 4$

c.  $y = x^2 + 4x + 4$ .

### Quadratic inequalities

3. Solve the following inequalities

a.  $x^2 - x - 2 < 0$

b.  $x^2 - 4 > 0$

c.  $x^2 - 9 > 0$

d.  $1 - x^2 \geq 0$

4. a. Sketch the parabola  $y = 4 - x^2$ .

b. From the graph, find values of  $x$  for which  $4 - x^2 \geq 0$ .

5. a. Sketch the parabola

$$y = x^2 - 5x + 6.$$

b. From the graph, find values of  $x$  for which  $x^2 - 5x + 6 > 0$ .

c. Write down values of  $x$  for which  $x^2 - 5x + 6 \leq 0$ .

6. By sketching  $y = -x^2 + 2x - 7$ , show that  $-x^2 + 2x - 7 < 0$  for all  $x$ .

7. Sketch the function  $f(x) = -5x^2 + 4x - 1$  and show that  $-5x^2 + 4x - 1 < 0$  for all  $x$ .

8. By sketching  $f(x) = x^2 + x + 2$ , show that  $x^2 + x + 2 > 0$  for all  $x$ .

9. Sketch  $y = 3x^2 + 2x + 1$  and hence show that  $3x^2 + 2x + 1 > 0$  for all  $x$ .

Questions categorised into subsections to help understand how the topics fit together

Questions are ordered from simple to difficult to help build understanding and confidence.

### Harder inequalities (extension)

10. Solve the following

a.  $\frac{1}{x+1} > 3$

b.  $\frac{1}{x-1} \leq -2$

c.  $\frac{1}{x-2} < 1$

d.  $\frac{2}{x+3} \geq 5$



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## SURDS

### Algebra & surds mixed question - test yourself

1. expand and simplify:  $4ab(a - 2b) - 2a^2(b - 3a)$
2. Find the value of  $n$  if  $(x + n)^2 = x^2 - 4x + 4$ .
3. Find the value of  $x + y$  with rational denominator if  $x = \sqrt{3} + 1$  and  $y = \frac{1}{2\sqrt{3} - 3}$ .
4. Factorise  $(x + 4)^2 + 5(x + 4)$
5. Factorise  $125x^3 + 343$
6. Factorise  $\frac{4}{x^2} - \frac{a^2}{b^2}$ .
7. Expand and simplify  $(x - 1)(x + 3)^2$ .
8. Simplify  $\frac{(a + 1)^3}{a^3 + 1}$ .
9.  $d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$  is the formula for the perpendicular distance from a point to a line. Find the exact value of  $d$  with a rational denominator if  $a = 2$ ,  $b = -1$ ,  $c = 3$ ,  $x_1 = -4$  and  $y_1 = 5$ .
10. Complete the square on  $x^2 + \frac{2}{3}x$ .
11. Find the exact value of
  - a.  $x^2 + \frac{1}{x^2}$  if  $x = \frac{1 + 2\sqrt{3}}{1 - 2\sqrt{3}}$
  - b.  $a$  and  $b$  if  $\frac{\sqrt{3} - 4}{2 + 3\sqrt{3}} = a + b\sqrt{3}$
12. If  $x = \frac{l x_1 + k x_2}{k + l}$ , find the value of  $x$  when  $k = 3$ ,  $l = -2$ ,  $x_1 = 5$  and  $x_2 = 4$ .
13. Simplify  $\frac{2x + y}{x - 3} + \frac{x - y}{x + 3} - \frac{3x + 2y}{x^2 + x - 6}$ .
14. If  $V = \pi r^2 h$  is the volume of a cylinder, find the exact value of  $r$  when  $V = 9$  and  $h = 16$ .
15. If  $s = u + \frac{1}{2}at^2$ , find the exact value of  $s$  when  $u = 2$ ,  $a = \sqrt{3}$  and  $t = 2\sqrt{3}$ .

Mixed revision questions  
at end of topic to test  
your knowledge