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The Modulus Function

(Haf 2005)

5. *(a)* Sketch the graph of $y = |x|$ for values of x from $x = -2$ to $x = 2$. [2]

(b) Solve the equation $|2x| + 3 = 4$. [1]

(c) Solve the inequality $|3x + 4| > 5$. [3]

(Gaeaf 2006)

6. *(a)* Solve the inequality $|3x - 8| \leqslant 5$. [3]

(b) Given that $f(x) = |x|$, sketch the graph of $y = f(x)$. On the same diagram, sketch the graph of $y = f(x + 2) + 1$, indicating its position. [4]

(Haf 2006)

6. Solve the following.

(a) $3|x| + 4 = 6 - 2|x|$ [2]

(b) $|7x - 5| \geqslant 3$ [3]

(Gaeaf 2007)

10. The functions f and g are defined for all values of x by

$$f(x) = x + 5,$$

$$g(x) = |2x + 1| + 2.$$

Solve the inequality $fg(x) > 10$. [5]

(Haf 2007)

4. *(a)* Sketch the graphs of $y = x^2 - 4$ and $y = |x^2 - 4|$, indicating the points where the graphs meet the x-axis and the y-axis. [4]

(b) Solve the inequality

$$|5x - 3| > 4.$$ [3]

(Gaeaf 2008)

6. *(a)* (i) Sketch the graph of $y = \ln x$.

(ii) On a separate diagram, sketch the graph of $y = |\ln x|$. [4]

(b) Solve $|3x - 2| < 4$. [4]

(Haf 2008)

6. *(b)* Solve $3|x| + 1 = 2 - |x|$. [2]

(c) Solve $|2x - 9| > 3$. [4]

(Gaeaf 2009)

6. Solve the following.

(a) $$\frac{2|x| + 9}{|x| + 1} = 5$$ [2]

(b) $|5x + 7| \leqslant 4$ [3]

(Haf 2009)

6. Solve the following.

(a) $|9x - 7| \leqslant 3$ [3]

(b) $\sqrt{5|x| + 1} = 3$ [2]

(Gaeaf 2010)

7. Solve the following.

(a) $2|x + 1| - 3 = 7$ [2]

(b) $|5x - 8| \geqslant 3$ [3]

(Haf 2010)

7. *(a)* Solve the inequality $|3x + 1| \leqslant 5$. [3]

(b) The function f is defined by $f(x) = |x|$.

(i) Sketch the graph of $y = f(x)$.

(ii) On a separate set of axes, sketch the graph of $y = f(x - 3) + 2$. On your sketch, indicate the coordinates of the point on the graph where the value of the y-coordinate is least and the coordinates of the point where the graph crosses the y-axis. [4]

(Gaeaf 2011)

7. Solve the following.

(a) $5|x| + 1 = 7 - 3|x|$ [2]

(b) $|3x - 1| > 5$ [3]

(Haf 2011)

7. *(a)* Show, by counter-example, that the statement

$$|a + b| \equiv |a| + |b|$$

is false. [2]

(b) Solve the equation

$$|2x + 1| = |3x - 4|$$ [3]

(Gaeaf 2012)

7. Solve the following.

(a) $|4x - 5| \geqslant 3$, [3]

(b) $(3|x| + 1)^{\frac{1}{3}} = 4$. [2]

(Haf 2012)

7. Solve the following.

(a) $4|x - 3| + 2 = 8 - 5|x - 3|$ [3]

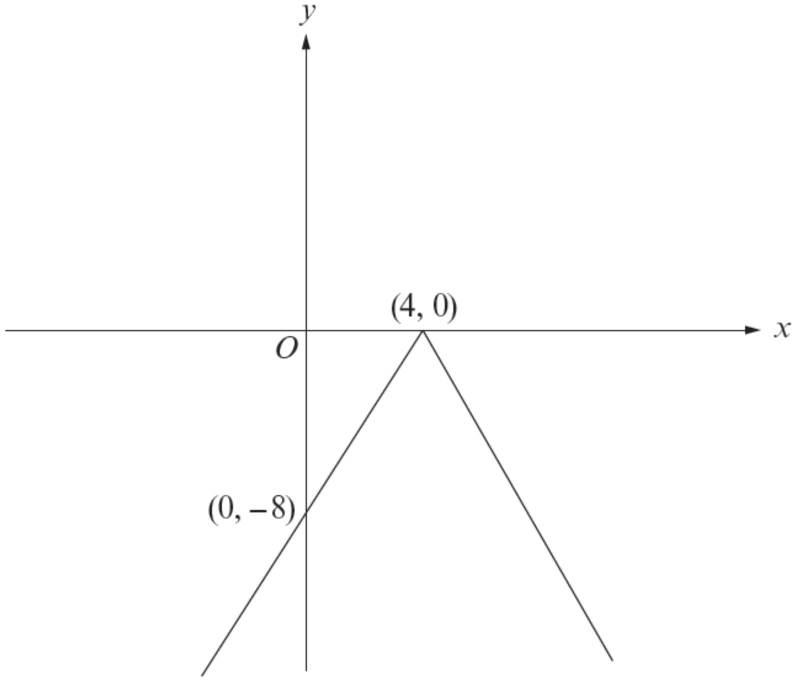
(b) $|5x - 2| \leqslant 3$ [3]

(Gaeaf 2013)

7. *(a)* Solve the inequality $| 3x - 4 | > 5$. [3]

(b) (i) Sketch the graph of $y = | x |$.

(ii) The diagram below shows a sketch of the graph of $y = a | x + b |$, where a and b are constants. The graph meets the x-axis at the point (4, 0) and the y-axis at the point (0, –8).



Find the value of a and the value of b. [3]

(Haf 2013)

7. *(a)* Show, by counter-example, that the statement

'If $|a + 1| = |b + 1|$, then $a = b$'

is false. [2]

(b) Solve the inequality

$$| x^2 - 10 | \leqslant 6.$$ [4]

(Gaeaf 2014)

8. Solve the equation

$$|3x + 4| = 2|x - 3|.$$ [3]

(Haf 2014)

8. *(a)* Show, by counter-example, that the statement

$$|2a + 3b| \equiv 2|a| + 3|b|$$

is false. [2]

(b) Solve the equation

$$|3x - 2| = 7|x|.$$ [3]

(Haf 2015)

8. *(a)* Find all values of x satisfying the inequality $|3x - 5| \leqslant 1$. [3]

(b) **Use your answer to part *(a)*** to find all values of y satisfying the inequality

$\left|\frac{3}{y} - 5\right| \leqslant 1.$ [2]

(Haf 2016)

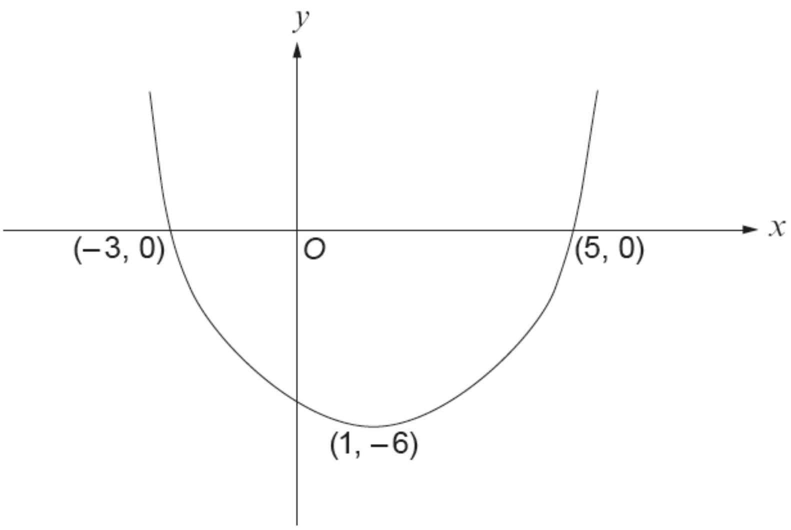
8. *(a)* Show, by counter-example, that the following statement is false.

'If the integers a, b, c, d are such that a is a factor of c and b is a factor of d, then $(a + b)$ is a factor of $(c + d)$.' [2]

(b) Solve the equation

$$|5x + 4| = -7x.$$ [4]

(c) The diagram shows a sketch of the graph of $y = f(x)$. The graph passes through the points $(-3, 0)$ and $(5, 0)$ and has a minimum point at $(1, -6)$.



(i) The graph of $y = 4f(x + a)$ passes through the origin. Write down the possible values of a.

(ii) The y-coordinate of the stationary point on the graph of $y = bf(x + 2)$ is 4. Write down the value of b. [2]

(Haf 2018)

8. *(a)* Show, by counter-example, that the statement

$$\text{'If } \sin\theta = \sin\phi \text{ then } \sin 2\theta = \sin 2\phi\text{'}$$

is false. [2]

(b) A straight railway line starts at station *O*. The next two stations on the line are station *S* and station *T*. Station *S* is 7 km from *O* and station *T* is 16 km from *O*. A footbridge *F* crosses over the line at a distance x km from *O*. The distance from *F* to *T* is 5 times the distance from *F* to *S*.

(i) Write down the given information in an equation of the form

$$|x - a| = b|x - c|,$$

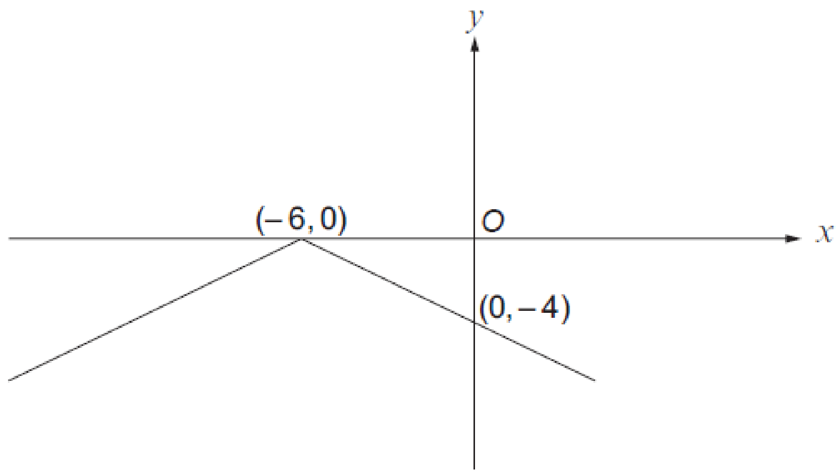
where the values of the constants a, b, c are to be found.

(ii) Solve your equation, and hence show that *F* can be at one of two points on the line. Find the distance of each of these points from *T*. [5]

(Haf 2019)

7. *(a)* Solve the inequality $|3x - 5| > 7$. [3]

(b) The diagram below shows a sketch of the graph of $y = a|x + b|$, where a, b are constants. The graph meets the x-axis at the point $(-6, 0)$ and the y-axis at the point $(0, -4)$.



Find the value of a and the value of b. [2]

(c) Show, by counter-example, that the following statement is false.

'If the positive integers m and n are such that m is a factor of n^2, then m must be a factor of n.' [2]