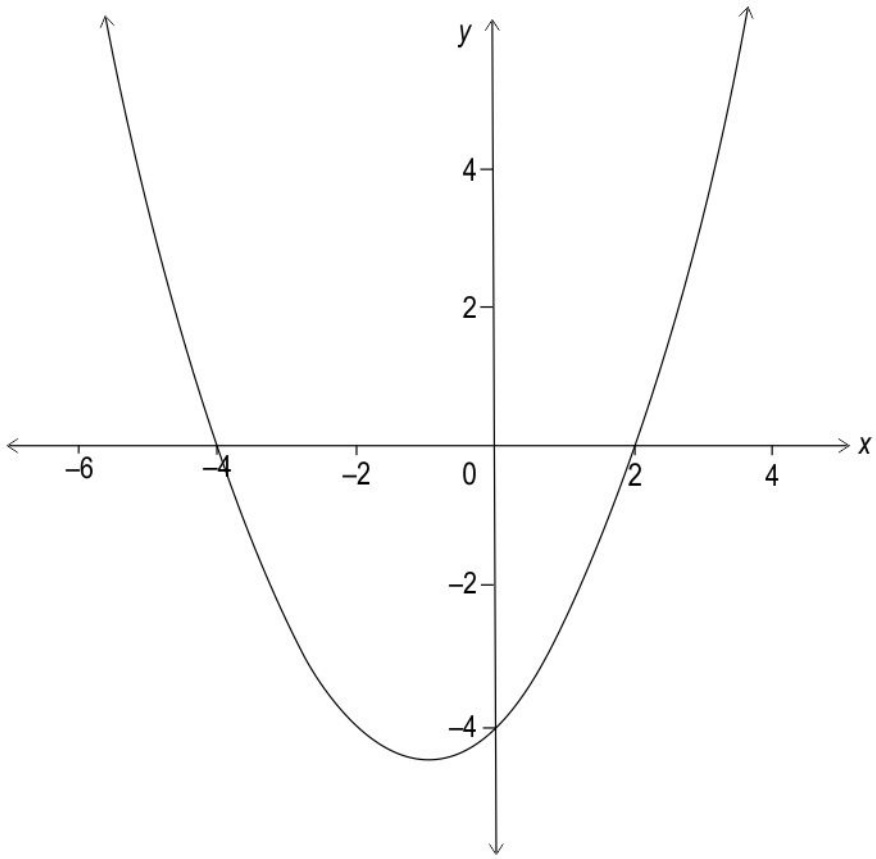
Polynomials

Multiple Choice Questions

Q: 1 **At which point will the graph of the polynomial $p(x) = (-x + 6x^2 - 1)$ intersects the negative x -axis?**

1 only $\frac{-1}{3}$
2 only $\frac{-1}{2}$
3 both $\frac{-1}{3}$ and $\frac{-1}{2}$
4 (none, it never intersects negative x -axis)

Q: 2 **Shown below is the graph of a quadratic polynomial.**



Which of these is the polynomial graphed above?

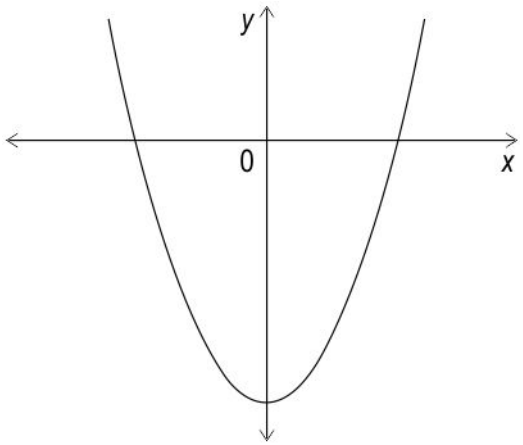
1 $(x - 2)(x + 4)$
2 $(x - 4)(x + 2)$
3 $\frac{1}{2}(x - 2)(x + 4)$
4 $\frac{1}{2}(x - 4)(x + 2)$

Free Response Questions

Q: 3 **State whether the following statement is true of false. Justify your answer.** **[1]**

If the graph of a polynomial has EXACTLY 2 zeroes, then the polynomial must be

Q: 4 **A quadratic polynomial $f(x)$ has two real zeroes that are equal. Adah drew the graph of $f(x)$ as shown below.** **[1]**



Is Adah's graph correct? Explain your answer.

Q: 5 **Aasira multiplied a variable with 4, subtracted 12 and added the square of the original variable. She expressed the final expression as a product of 2 factors.** **[3]**

Her friend, Rishi, said that the factors will always have a difference of 8.

Is Rishi right? Show your work.

Q: 6 **$g(x) = px^2 + qx + 152$ is a polynomial where p and q are real numbers. The zeroes of $g(x)$ are distinct prime numbers. Find the:** **[5]**

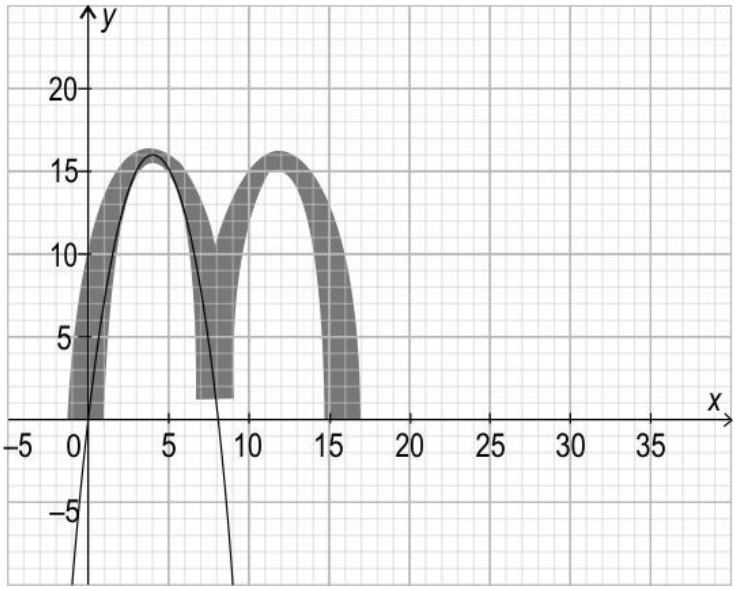
i) zeroes of $g(x)$.
ii) values of p and q.

Show your work and give valid reasons.

Case-Based Questions

Answer the questions based on the given information.

Shown below is a logo that is made up of two intersecting golden arches, which are parabolic in shape. One such parabola, coinciding with the first arch in the logo, is shown in the graph below.



Q: 7 **Write an equation to represent the parabola shown in the graph.** **[2]**

Show your work and give valid reasons.

Q: 8 **State whether the following statements are true or false.** **[3]**

i) If the zeroes of the parabola, $ax^2 + bx + c = 0$, coinciding with the second arch in the logo are given by σ and 2σ, then *c* will be negative.

ii) If the logo is shifted so that it is symmetrical about the *y* -axis, then the constant term in the equation of the parabola made by the first arch will be positive.

Justify your answers.

Q.No	Correct Answers
1	1
2	4

Q.No	What to look for	Marks
3	Writes that the statement is false.	0.5
	Gives reason that while a quadratic polynomial must have a maximum of 2 zeroes, a graph with exactly 2 zeroes need not be that of a quadratic polynomial. For example: The graph of a cubic polynomial of the form $(x - a)(x - b)^2$ will have only two zeroes, a and b.	0.5
4	Writes that the graph Adah has drawn is incorrect.	0.5
	Gives a valid reason. For example, since $f(x)$ has real and equal zeroes, the graph of $f(x)$ intersects the x-axis at a unique point.	0.5
5	Assumes the original variable as x and frames the expression as $4x - 12 + x^2$.	1
	Factorises the above expression as $(x - 2)(x + 6)$.	1
	Concludes that Rishi was right as the above factors have a difference of 8.	1
6	i) Writes the equation for the product of zeroes as: product of zeroes = $\frac{152}{p}$	1
	Writes the prime factorisation of 152 as $2^3 \times 19$.	0.5
	Writes that since the zeroes are distinct prime numbers, finds the zeroes of $g(x)$ as 2 and 19.	1
	Finds the value of p as $\frac{152}{38} = 4$.	0.5
	ii) Writes the equation for the sum of zeroes as: $2 + 19 = \frac{-q}{4}$	1
	Solves the above equation to find the value of q as (-84).	1

Q.No	What to look for	Marks
7	Identifies zeroes of the quadratic equation as 0 and 8. Identifies that the coefficient of x^2 must be negative, since the given parabola is facing downward.	1
	Takes $\alpha + \beta = \frac{-b}{a} = 8$ and $\alpha\beta = \frac{c}{a} = 0$, where α and β are the zeroes of the parabola, and a, b and c represent the coefficient of x^2, the coefficient of x and the constant respectively.	0.5
	Finds one equation representing the parabola, by picking a value for a and, accordingly choosing values for b and c. For example, when $a = (-1)$, the required equation is $-x^2 + 8x = 0$.	0.5
8	i) Writes that the statement is true.	0.5
	Justifies with a reason. For example, $\frac{c}{a} = 2\sigma^2$, which cannot be negative. a is negative as the parabola is facing downward. Since a is negative, c must also be negative.	1
	ii) Writes that the statement is false.	0.5
	Justifies with a reason. For example, When the parabola is shifted, the new zeroes of the first arch will be (-8) and 0. As 0 is a zero of the arch, $c = 0$. This is because $\alpha\beta = \frac{c}{a} = 0$, where α, β are zeroes of the polynomial.	1