Due date for this assignment: 2025-10-15, 23:59 IST.

You may submit any number of times before the due date. The final submission will be considered for grading.

You have last submitted on: 2025-10-09, 12:39 IST

There are some questions which have functions with discrete valued domains (such as day, month, year etc). For simplicity, we treat them as continuous functions.

For NAT type question, enter only one right answer, even if you get multiple answers for that particular question.

Notations:

$\mathbb{R}$ = Set of real numbers $\mathbb{Q}$ = Set of rational numbers
$\mathbb{Z}$ = Set of integers
$\mathbb{N}$ = Set of natural numbers

The set of natural numbers includes 0.

1) If the slope of parabola $y = ax^2 + bx + c$, where $a, b, c \in \mathbb{R} \setminus \{0\}$ at points $(3, 2)$ and $(2, 3)$ are 34 and 20 respectively, then find the value of a.

7

1 point

2) A class of 234 students are arranged in rows such that the number of students in a row is one less than thrice the number of rows. Find the number of students in each row.

26

1 point

3) The product of two consecutive odd natural numbers is 399. Find the largest number among them.

21

1 point

4) The slope of a parabola $y = 3x^2 - 11x + 10$ at a point P is 7. Find the $y-$ coordinate of the point P.

4

1 point

5) Find out the points where the curve $y = 4x^2 + x$ and the straight line $y = 2x - 3$ intersect with each other. ***1 point***

- $(\frac{3}{2}, 0)$ and $(\frac{3}{2}, \frac{21}{2})$.
- Only at the origin.
- The curve and the straight line do not intersect.
- $(1, -1)$ and $(1, 5)$.

6) In order to cover a fixed distance of 48 km, two vehicles start from the same place. The faster one takes 2 hrs less and has a speed 4 km/hr more than the slower one. Using the given information,
What is the time (in hrs) taken by the faster one?

4

1 point

7) Two parabolas $y = x^2 + 3x + 2$ and $y = -x^2 - 5x - 4$ are intersecting at two points A (point A is not on the $X-$ axis) and B. Suppose a straight line ℓ_1 passes through the point A with slope equal to the slope of the parabola $y = -x^2 - 5x - 4$ at point A and two straight lines ℓ_2 and ℓ_3 pass through the point B with slopes equal to the slopes of the parabolas $y = x^2 + 3x + 2$ and $y = -x^2 - 5x - 4$ at point B, respectively. Which of the following is/are true? ***1 point***

- [x] ℓ_1 and ℓ_2 are parallel.
- [ ] ℓ_1 and ℓ_3 are parallel.
- [x] ℓ_1 and ℓ_3 are intersecting at point (-2, 3).
- [x] ℓ_2 and ℓ_3 are intersecting at point (-1, 0).
- [ ] ℓ_2 and ℓ_3 are parallel.

8) If the slope of the parabola $y = ax^2 + bx + c$ at (2, 3) is 5 and the $X-$ coordinate of the vertex of the parabola is 3, then which of the following is/are true? ***1 point***

- [x] $y = -\frac{5}{2}x^2 + 15x - 17$
- [ ] $y = \frac{5}{2}x^2 + 15x - 17$
- [ ] $y = -\frac{5}{2}x^2 + 15x + 17$
- [x] $6y = -15x^2 + 90x - 102$

9) A water fountain is designed to shoot a stream of water in the shape of a parabolic arc. The equation of the parabola is given by $h(t) = -0.5t^2 + 4t + 1$, where $h(t)$ represents the height of the water stream in meters and t represents the time in seconds since the water was shot.
Determine the maximum height reached (in meters).

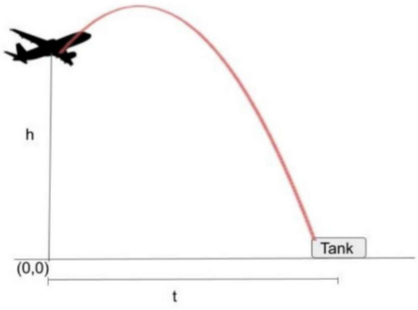
9

1 point

10) Which of the following is/are correct ***1 point***

- [x] x intercepts of the quadratic function $f(x)$ are known as the real roots of the quadratic equation $f(x) = 0$.
- [ ] If discriminant for two quadratic equations are same then they must be the same quadratic equations.
- [x] The slope at the vertex of the quadratic function is zero.
- [x] Every Quadratic function has axis of symmetry.
- [ ] Suppose $P(x)$ is a Quadratic function and L be any straight line, then L must intersect the graph of $P(x)$.

Use the following information for questions 1-3. A ballistic missile is launched from a fighter jet flying at a height of 40 m from the ground. The missile hits the tank which is present on the ground, as shown in Figure M1G3T5-2. The function $h(t) = -8t^2 + 32t + 40$ represents the height (in meters) of the missile after t seconds. Assume the dimensions of the tank and the fighter jet are negligible.



11) Find out the maximum height(in meters) attained by the missile.

72

1 point

12) Find out the time (in seconds) when the missile hits the tank.

5

1 point

13) Suppose an air defense system is present at the origin, and it follows the straight line path $h(t) = 10t$, find the height from the ground at which the air defense missile will destroy the ballistic missile in the air. ***1 point***

- 40 m
- 12.5 m
- 4 m
- 1.25 m

14) The polynomial $p(x) = a(x - 4)(x - 6)(x - 8)(x - 10)$ passes through the vertex of the quadratic function $q(x) = -(x - 7)^2 - 9$. Calculate the value of a.

-1

1 point