



SCHOLASTIC APTITUDE TEST (SAT)

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## Drill Problems: Week 2.6

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Written by Jaehoon Song (Lecturer)

**1. Rectangle Area Function** (10 points)

A rectangle has a length that is 15 times its width. The function  $y = (15w)(w)$  represents this situation, where  $y$  is the area, in square feet, of the rectangle and  $y > 0$ . Which of the following is the best interpretation of  $15w$  in this context?

- (A) The length of the rectangle, in feet
- (B) The area of the rectangle, in square feet
- (C) The difference between the length and the width of the rectangle, in feet
- (D) The width of the rectangle, in feet

**Answer:**

□

**2. Quadratic Function Roots** (10 points)

The quadratic function  $h$  is defined as shown.

$$h(x) = 2(x - 4)^2 - 32$$

In the  $xy$ -plane, the graph of  $y = h(x)$  intersects the  $x$ -axis at the points  $(0, 0)$  and  $(t, 0)$ , where  $t$  is a constant.

What is the value of  $t$ ?

- (A) 1
- (B) 2
- (C) 4
- (D) 8

**Answer:**

□

**3. Exponential Function Y-Intercept** (10 points)

The function  $f$  is defined by  $f(x) = (-8)(2)^x + 22$ . What is the  $y$ -intercept of the graph of  $y = f(x)$  in the  $xy$ -plane?

- (A)  $(0, 14)$
- (B)  $(0, 2)$
- (C)  $(0, 22)$
- (D)  $(0, -8)$

**Answer:**

□

## 4. Ball Height Interpretation (10 points)

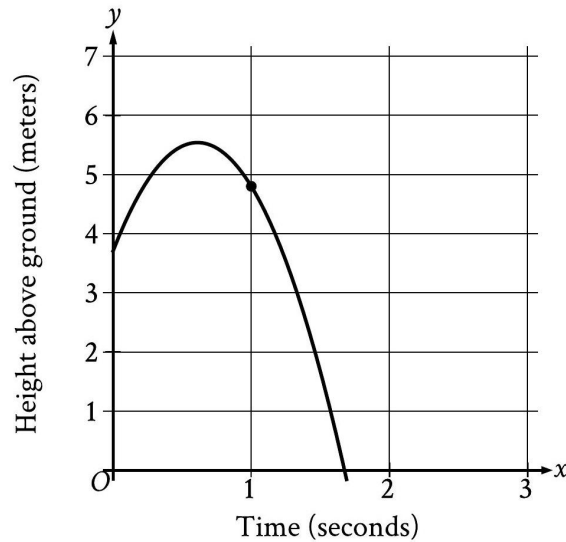


Figure 1: reference attached

The graph shows the height above ground, in meters, of a ball  $x$  seconds after the ball was launched upward from a platform. Which statement is the best interpretation of the marked point  $(1.0, 4.8)$  in this context?

- (A) 1.0 second after being launched, the ball's height above ground is 4.8 meters.
- (B) 4.8 seconds after being launched, the ball's height above ground is 1.0 meter.
- (C) The ball was launched from an initial height of 1.0 meter with an initial velocity of 4.8 meters per second.
- (D) The ball was launched from an initial height of 4.8 meters with an initial velocity of 1.0 meter per second.

**Answer:**



**5. Exponential Decay Y-Intercept** (10 points)

The given function  $f$  models the number of advertisements a company sent to its clients each year, where  $x$  represents the number of years since 1997, and  $0 \leq x \leq 5$ .

$$f(x) = 9,000(0.66)^x$$

If  $y = f(x)$  is graphed in the  $xy$ -plane, which of the following is the best interpretation of the  $y$ -intercept of the graph in this context?

- (A) The minimum estimated number of advertisements the company sent to its clients during the 5 years was 1,708.
- (B) The minimum estimated number of advertisements the company sent to its clients during the 5 years was 9,000.
- (C) The estimated number of advertisements the company sent to its clients in 1997 was 1,708.
- (D) The estimated number of advertisements the company sent to its clients in 1997 was 9,000.

**Answer:**

□

**6. Geometric Sequence Formula** (10 points)

The first term of a sequence is 9. Each term after the first is 4 times the preceding term. If  $w$  represents the  $n$ th term of the sequence, which equation gives  $w$  in terms of  $n$ ?

- (A)  $w = 4(9^n)$
- (B)  $w = 4(9^{n-1})$
- (C)  $w = 9(4^n)$
- (D)  $w = 9(4^{n-1})$

**Answer:**

□

## 7. Graph Y-Intercept (10 points)

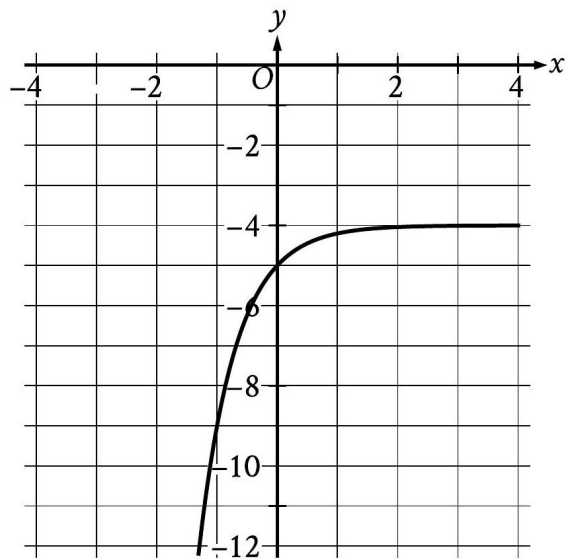


Figure 2: reference attached

What is the  $y$ -intercept of the graph shown?

- (A)  $(-1, -9)$
- (B)  $(0, -5)$
- (C)  $(0, -4)$
- (D)  $(0, 0)$

**Answer:**

□

8. **Savings Account Exponential Model** (10 points)

Rosa opened a savings account at a bank. The table shows the exponential relationship between the time  $t$ , in years, since Rosa opened the account and the total amount  $n$ , in dollars, in the account. If Rosa made no

**Savings Account Balance**

Time (years)	Total amount (dollars)
0	604.00
1	606.42
2	608.84

additional deposits or withdrawals, which of the following equations best represents the relationship between  $t$  and  $n$ ?

- (A)  $n = 604(1.004)^t$
- (B)  $n = 604(1.04)^t$
- (C)  $n = 604(1.004)^{t+1}$
- (D)  $n = 0.004(604)^t$

**Answer:**



9. **Exponential Function Parameters** (10 points)

Function  $f$  is defined by  $f(x) = -a^x + b$ , where  $a$  and  $b$  are constants. In the  $xy$ -plane, the graph of  $y = f(x) - 12$  has a  $y$ -intercept at  $(0, -\frac{75}{7})$ . The product of  $a$  and  $b$  is  $\frac{320}{7}$ . What is the value of  $a$ ?

**Answer:**



10. Ocean Water Level Model (10 points)

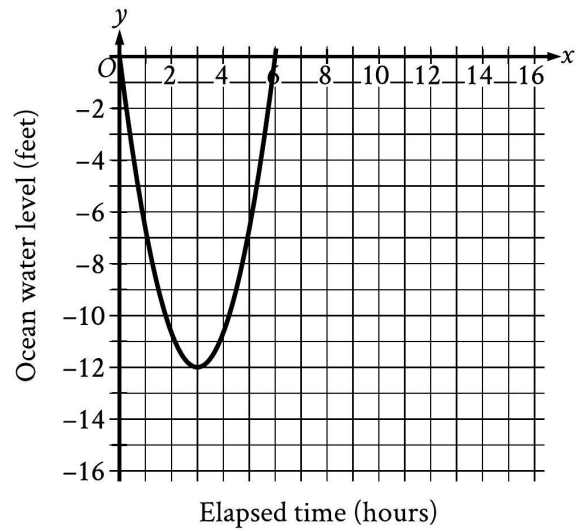


Figure 3: reference attached

Scientists recorded data about the ocean water levels at a certain location over a period of 6 hours. The graph shown models the data, where  $y = 0$  represents sea level. Which table gives values of  $x$  and their corresponding values of  $y$  based on the model?

(A)

$x$	$y$
0	-12
0	3
6	6

(A)

$x$	$y$
0	0
3	12
0	-6

(A)

$x$	$y$
0	0
3	-12
6	0

(A)

$x$	$y$
0	0
12	6
-6	0

Answer:



11. Square Root Function Evaluation (10 points)

The function  $f$  is defined by  $f(x) = 4 + \sqrt{x}$ . What is the value of  $f(144)$ ?

- (A) 0
- (B) 16
- (C) 40
- (D) 76

Answer:



**12. Rectangular Court Dimensions** (10 points)

A rectangular volleyball court has an area of 162 square meters. If the length of the court is twice the width, what is the width of the court, in meters?

- (A) 9
- (B) 18
- (C) 27
- (D) 54

**Answer:**

**13. Softball Height Equation** (10 points)

A machine launches a softball from ground level. The softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds and hits the ground at 3.6 seconds. Which equation represents the height above ground  $h$ , in meters, of the softball  $t$  seconds after it is launched?

- (A)  $h = -t^2 + 3.6$
- (B)  $h = -t^2 + 51.84$
- (C)  $h = -64(t - 2.7)^2 + 51.84$
- (D)  $h = -16t^2 + 57.6t$

**Answer:**

**14. Exponential Function Intercepts** (10 points)

The function  $f$  is defined by  $f(x) = a^x + b$ , where  $a$  and  $b$  are constants. In the  $xy$ -plane, the graph of  $y = f(x)$  has an  $x$ -intercept at  $(2, 0)$  and a  $y$ -intercept at  $(0, -323)$ . What is the value of  $b$ ?

**Answer:**

**15. Salary Growth Model** (10 points)

The function  $S$  above models the annual salary, in dollars, of an employee  $n$  years after starting a job, where  $a$  is a constant.

$$S(n) = 38,000a^n$$

If the employee's salary increases by 4% each year, what is the value of  $a$ ?

- (A) 0.04
- (B) 0.4
- (C) 1.04
- (D) 1.4

**Answer:**





16. **Revenue Function Interpretation** (10 points)

The revenue  $f(x)$ , in dollars, that a company receives from sales of a product is given by the function  $f$  above, where  $x$  is the unit price, in dollars, of the product.

$$f(x) = -500x^2 + 25\,000x$$

The graph of  $y = f(x)$  in the  $xy$ -plane intersects the  $x$ -axis at 0 and  $a$ . What does  $a$  represent?

- (A) The revenue, in dollars, when the unit price of the product is \$0
- (B) The unit price, in dollars, of the product that will result in maximum revenue
- (C) The unit price, in dollars, of the product that will result in a revenue of \$0
- (D) The maximum revenue, in dollars, that the company can make

**Answer:**

17. **Bacteria Growth Prediction** (10 points)

A culture of bacteria is growing at an exponential rate, as shown in the table above. At this rate, on which

**Growth of a Culture of Bacteria**

Day	Number of bacteria per milliliter at end of day
1	$2.5 \times 10^5$
2	$5.0 \times 10^5$
3	$1.0 \times 10^6$

day would the number of bacteria per milliliter reach  $5.12 \times 10^8$ ?

- (A) Day 5
- (B) Day 9
- (C) Day 11
- (D) Day 12

**Answer:**



18. **Data Traffic Model Interpretation** (10 points)

The equation above estimates the global data traffic  $D$ , in terabytes, for the year that is  $t$  years after 2010.

$$D = 5,640(1.9)^t$$

What is the best interpretation of the number 5,640 in this context?

- (A) The estimated amount of increase of data traffic, in terabytes, each year
- (B) The estimated percent increase in the data traffic, in terabytes, each year
- (C) The estimated data traffic, in terabytes, for the year that is  $t$  years after 2010
- (D) The estimated data traffic, in terabytes, in 2010

**Answer:**

19. **Quadratic Function Properties** (10 points)

In the given quadratic function,  $a$  and  $c$  are constants. The graph of  $y = f(x)$  in the  $xy$ -plane is a parabola that opens upward and has a vertex at the point  $(h, k)$ , where  $h$  and  $k$  are constants.

$$f(x) = ax^2 + 4x + c$$

If  $k < 0$  and  $f(-9) = f(3)$ , which of the following must be true?

- (I)  $c < 0$
- (II)  $a \geq 1$
- (A) I only
- (B) II only
- (C) I and II
- (D) Neither I nor II

**Answer:**

20. **Exponent Rules** (10 points)

Which expression is equivalent to  $(m^4q^4z^{-1})(mq^5z^3)$ , where  $m$ ,  $q$ , and  $z$  are positive?

- (A)  $m^4q^{20}z^{-3}$
- (B)  $m^5q^9z^2$
- (C)  $m^6q^8z^{-1}$
- (D)  $m^{20}q^{12}z^{-2}$

**Answer:**



21. **Polynomial Factoring** (10 points)

Which of the following is a factor of the polynomial above?

$$4a^2 + 20ab + 25b^2$$

- (A)  $a + b$
- (B)  $2a + 5b$
- (C)  $4a + 5b$
- (D)  $4a + 25b$

**Answer:**

22. **Polynomial Operations** (10 points)

If  $p = 3x + 4$  and  $v = x + 5$ , which of the following is equivalent to  $pv - 2p + v$ ?

- (A)  $3x^2 + 12x + 7$
- (B)  $3x^2 + 14x + 17$
- (C)  $3x^2 + 19x + 20$
- (D)  $3x^2 + 26x + 33$

**Answer:**

23. **Linear Expression Simplification** (10 points)

Which of the following is equivalent to the given expression?

$$(x + 5) + (2x - 3)$$

- (A)  $3x - 2$
- (B)  $3x + 2$
- (C)  $3x - 8$
- (D)  $3x + 8$

**Answer:**



**24. Rational Expression Simplification** (10 points)

Which expression is equivalent to  $\frac{8x(x-7)-3(x-7)}{2x-14}$ , where  $x > 7$ ?

- (A)  $\frac{x-7}{5}$
- (B)  $\frac{8x-3}{2}$
- (C)  $\frac{8x^2-3x-14}{2x-14}$
- (D)  $\frac{8x^2-3x-77}{2x-14}$

**Answer:**

☐**25. Polynomial Factoring** (10 points)

Which of the following is equivalent to the expression  $x^4 - x^2 - 6$ ?

- (A)  $(x^2 + 1)(x^2 - 6)$
- (B)  $(x^2 + 2)(x^2 - 3)$
- (C)  $(x^2 + 3)(x^2 - 2)$
- (D)  $(x^2 + 6)(x^2 - 1)$

**Answer:**

☐**26. Polynomial Expansion** (10 points)

Which of the following is equivalent to the expression above?

$$(2x + 5)^2 - (x - 2) + 2(x + 3)$$

- (A)  $4x^2 + 21x + 33$
- (B)  $4x^2 + 21x + 29$
- (C)  $4x^2 + x + 29$
- (D)  $4x^2 + x + 33$

**Answer:**

☐

27. **Polynomial Multiplication** (10 points)

The equation above is true for all  $x$ , where  $a$  and  $b$  are constants.

$$(ax + 3)(5x^2 - bx + 4) = 20x^3 - 9x^2 - 2x + 12$$

What is the value of  $ab$ ?

- (A) 18
- (B) 20
- (C) 24
- (D) 40

**Answer:**

28. **Difference of Squares** (10 points)

Which of the following expressions is equivalent to  $x^2 - 5$ ?

- (A)  $(x + \sqrt{5})^2$
- (B)  $(x - \sqrt{5})^2$
- (C)  $(x + \sqrt{5})(x - \sqrt{5})$
- (D)  $(x + 5)(x - 1)$

**Answer:**

29. **Quadratic Factoring** (10 points)

Which of the following expressions is(are) a factor of  $3x^2 + 20x - 63$ ?

- (I)  $x - 9$
  - (II)  $3x - 7$
- (A) I only
  - (B) II only
  - (C) I and II
  - (D) Neither I nor II

**Answer:**

30. **Rational Exponent Simplification** (10 points)

If  $\frac{\sqrt{x^5}}{\sqrt[3]{x^4}} = x^{\frac{a}{b}}$  for all positive values of  $x$ , what is the value of  $\frac{a}{b}$ ?

**Answer:**



31. **Polynomial Factoring** (10 points)

The expression  $90y^5 - 54y^4$  is equivalent to  $ry^4(15y - 9)$ , where  $r$  is a constant. What is the value of  $r$ ?

**Answer:**

□

32. **Rational Equation** (10 points)

The equation above is true for all  $x > 2$ , where  $r$  and  $t$  are positive constants.

$$\frac{2}{x-2} + \frac{3}{x+5} = \frac{x+t}{(x-2)(x+5)}$$

What is the value of  $rt$ ?

- (A) -20
- (B) 15
- (C) 20
- (D) 60

**Answer:**

□

33. **Polynomial Simplification** (10 points)

Which of the following is an equivalent form of  $(1.5x - 2.4)^2 - (5.2x^2 - 6.4)$ ?

- (A)  $-2.2x^2 + 1.6$
- (B)  $-2.2x^2 + 11.2$
- (C)  $-2.95x^2 - 7.2x + 12.16$
- (D)  $-2.95x^2 - 7.2x + 0.64$

**Answer:**

□

34. **Root Expression Simplification** (10 points)

For what value of  $x$  is the given expression equivalent to  $(70n)^{30x}$ , where  $n > 1$ ?

$$\sqrt[5]{70n}(\sqrt[6]{70n})^2$$

**Answer:**

□

## 35. System of Equations Solutions (10 points)

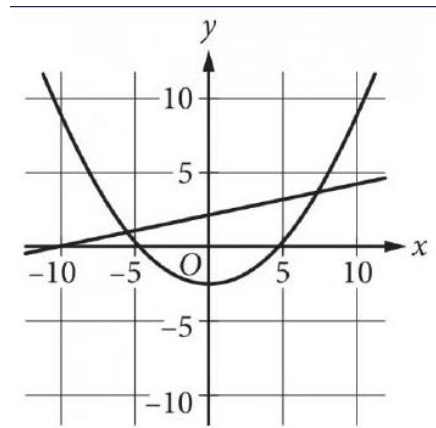


Figure 4: reference attached

A system of equations consists of a quadratic equation and a linear equation. The equations in this system are graphed in the  $xy$ -plane above. How many solutions does this system have?

- (A) 0
- (B) 1
- (C) 2
- (D) 3

**Answer:**

□

## 36. Linear Inequality (10 points)

Which of the following inequalities is equivalent to the inequality above?

$$6x - 9y > 12$$

- (A)  $x - y > 2$
- (B)  $2x - 3y > 4$
- (C)  $3x - 2y > 4$
- (D)  $3y - 2x > 2$

**Answer:**

□

37. **System of Equations Solution** (10 points)

If  $(x, y)$  is a solution to the system of equations above, which of the following could be the value of  $x$ ?

$$y = x + 1$$

$$y = x^2 + x$$

- (A) -1
- (B) 0
- (C) 2
- (D) 3

**Answer:**

☐38. **Quadratic Equation Solutions** (10 points)

What values satisfy the equation above?

$$x^2 - x - 1 = 0$$

- (A)  $x = 1$  and  $x = 2$
- (B)  $x = -\frac{1}{2}$  and  $x = \frac{3}{2}$
- (C)  $x = \frac{1+\sqrt{5}}{2}$  and  $x = \frac{1-\sqrt{5}}{2}$
- (D)  $x = \frac{-1+\sqrt{5}}{2}$  and  $x = \frac{-1-\sqrt{5}}{2}$

**Answer:**

☐39. **Function Intersection** (10 points)

The graphs of the given equations intersect at the point  $(x, y)$  in the  $xy$ -plane.

$$x = 49$$

$$y = \sqrt{x} + 9$$

What is the value of  $y$ ?

- (A) 16
- (B) 40
- (C) 81
- (D) 130

**Answer:**

☐40. **Absolute Value Equation** (10 points)

What is the positive solution to the given equation?

$$2|4 - x| + 3|4 - x| = 25$$

**Answer:**

☐



41. **Quadratic Equation Solution** (10 points)

One solution to the given equation can be written as  $1 + \sqrt{k}$ , where  $k$  is a constant.

$$x^2 - 2x - 9 = 0$$

What is the value of  $k$ ?

- (A) 8
- (B) 10
- (C) 20
- (D) 40

**Answer:**

42. **Parabola and Line Intersection** (10 points)

In the  $xy$ -plane, a line with equation  $2y = 4.5$  intersects a parabola at exactly one point. If the parabola has equation  $y = -4x^2 + bx$ , where  $b$  is a positive constant, what is the value of  $b$ ?

**Answer:**

43. **System of Equations Solution** (10 points)

Which ordered pair is a solution to the system of equations above?

$$\begin{aligned}x - y &= 1 \\x + y &= x^2 - 3\end{aligned}$$

- (A)  $(1 + \sqrt{3}, \sqrt{3})$
- (B)  $(\sqrt{3}, -\sqrt{3})$
- (C)  $(1 + \sqrt{5}, \sqrt{5})$
- (D)  $(\sqrt{5}, -1 + \sqrt{5})$

**Answer:**



44. **Variable Isolation** (10 points)

The given equation relates the variables  $r$ ,  $s$ , and  $t$ . Which equation correctly expresses  $s$  in terms of  $r$  and  $t$ ?

$$6r = 7s + t$$

- (A)  $s = 42r - t$
- (B)  $s = 7(6r - t)$
- (C)  $s = \frac{6}{7}r - t$
- (D)  $s = \frac{6r-t}{7}$

**Answer:**

□

45. **Rational Equation Solution** (10 points)

If  $x$  is a solution to the given equation, which of the following is a possible value of  $x + 5$ ?

$$\frac{1}{x^2 + 10x + 25} = 4$$

- (A)  $\frac{1}{2}$
- (B)  $\frac{5}{2}$
- (C)  $\frac{9}{2}$
- (D)  $\frac{11}{2}$

**Answer:**

□

46. **Acceleration Equation** (10 points)

During a 5-second time interval, the average acceleration  $a$ , in meters per second squared, of an object with an initial velocity of 12 meters per second is defined by the equation

$$a = \frac{v_f - 12}{5}$$

, where  $v_f$  is the final velocity of the object in meters per second. If the equation is rewritten in the form  $v_f = xa + y$ , where  $x$  and  $y$  are constants, what is the value of  $x$ ?

**Answer:**

□

47. **Function Intersection** (10 points)

The graphs of the given equations in the  $xy$ -plane intersect at the point  $(x, y)$ .

$$\begin{aligned}y &= 76 \\ y &= x^2 - 5\end{aligned}$$

What is a possible value of  $x$ ?

- (A)  $-\frac{76}{5}$
- (B)  $-9$
- (C)  $5$
- (D)  $76$

**Answer:**

48. **Variable Isolation** (10 points)

The given equation relates the positive numbers  $m$ ,  $n$ , and  $p$ . Which equation correctly gives  $n$  in terms of  $m$  and  $p$ ?

$$7m = 5(n + p)$$

- (A)  $n = \frac{5p}{7m}$
- (B)  $n = \frac{7m}{5} - p$
- (C)  $n = 5(7m) + p$
- (D)  $n = 7m - 5 - p$

**Answer:**

49. **Quadratic Equation Solution** (10 points)

Which of the following is a solution to the equation above?

$$2x^2 - 2 = 2x + 3$$

- (A)  $2$
- (B)  $1 - \sqrt{11}$
- (C)  $\frac{1}{2} + \sqrt{11}$
- (D)  $\frac{1 + \sqrt{11}}{2}$

**Answer:**

50. **Parabola and Line Intersection** (10 points)

In the  $xy$ -plane, a line with equation  $2y = c$  for some constant  $c$  intersects a parabola at exactly one point. If the parabola has equation  $y = -2x^2 + 9x$ , what is the value of  $c$ ?

**Answer:**



## 51. System of Equations Solution (10 points)

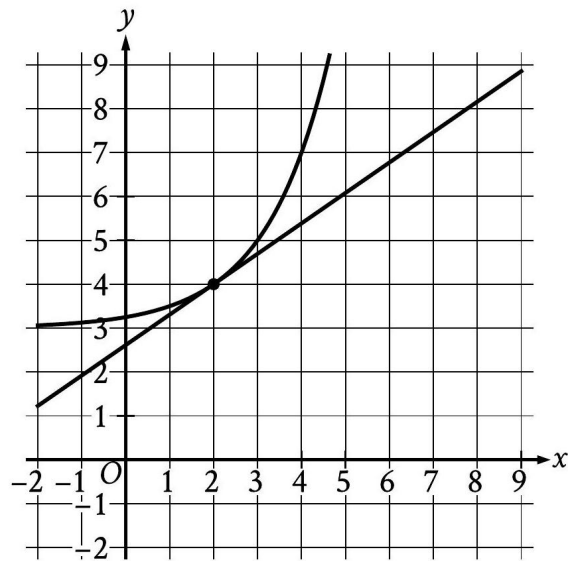


Figure 5: reference attached

The graph of a system of a linear equation and a nonlinear equation is shown. What is the solution  $(x, y)$  to this system?

- (A)  $(0, 0)$
- (B)  $(0, 2)$
- (C)  $(2, 4)$
- (D)  $(4, 0)$

**Answer:**

□

## 52. Polynomial Roots Product (10 points)

What is the product of the solutions to the given equation?

$$(x - 4)(x + 2)(x - 1) = 0$$

- (A) 8
- (B) 3
- (C) -3
- (D) -8

**Answer:**

□

53. **Rational Equation Solution** (10 points)  
What is the solution to the equation above?

$$\frac{2(x+1)}{x+5} = 1 - \frac{1}{x+5}$$

- (A) 0
- (B) 2
- (C) 3
- (D) 5

**Answer:**



54. **Radical Equation** (10 points)  
What is the smallest solution to the given equation?

$$\sqrt{(x-2)^2} = \sqrt{3x+34}$$

**Answer:**

