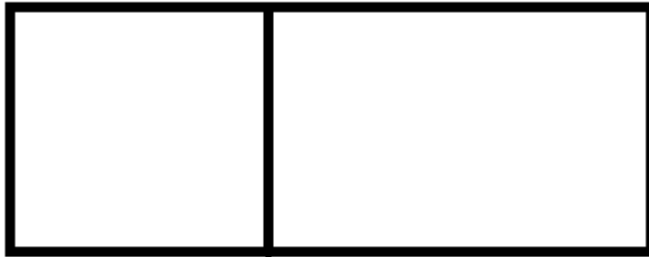




**SCHOLARSHIP TEST 2016 page 2**

11. Wiley needs to build a rectangular pig pen with maximum area. He remembers from his high school math class that a square pen will provide the maximum area. However, his wife Matilda reminds him that two of the hogs do not get along very well and need to be separated. She suggests that the pen remains rectangular, but has a dividing section placed somewhere within the rectangle. (One option is shown below.) If there is a total of 180 feet of fence available, what is the maximum area of the pig pen using her suggestion?



- A) 2025 ft<sup>2</sup>
- B) 1350 ft<sup>2</sup>
- C) 1296 ft<sup>2</sup>
- D) 1200 ft<sup>2</sup>
- E) none of these

12. Evaluate:  $\lim_{x \rightarrow 3^+} f(x)$        $f(x) = \begin{cases} 5 & \text{if } x < -2 \\ x + 2 & \text{if } -2 < x \leq 3 \\ x^3 - 5 & \text{if } x > 3 \end{cases}$

A) 4      B) 5      C) 22      D) 0      E) none of these

13. If  $y = \frac{x-3}{x^2}$  find  $y'(-2)$

A) -1      B)  $-\frac{1}{4}$       C)  $-\frac{5}{4}$       D)  $\frac{1}{2}$       E) none of these

14. For what value of the constant c is the function continuous?  $f(x) = \begin{cases} x + 2 & \text{if } x \leq 6 \\ x^2 + cx - 4 & \text{if } x > 6 \end{cases}$

A) -4      B) 8      C) 24      D) 6      E) none of these

15. What is the equation of the tangent line to the curve  $y = \sqrt[3]{x-1}$  at  $x=1$ ?

A)  $y = 0$       B)  $x = 1$       C)  $y = x + 1$       D)  $y = \frac{1}{3}x - \frac{1}{3}$       E) doesn't exist

16. If  $x + y^2 = 4$  find  $\frac{dx}{dy}$ .

A)  $\frac{dx}{dy} = \frac{-1}{2y}$       B)  $\frac{dx}{dy} = -2y$       C)  $\frac{dx}{dy} = \frac{-3}{2x}$       D)  $\frac{dx}{dy} = \frac{-3}{2x}$       E) doesn't exist

17. Which answer is an antiderivative of  $12x^2$ ?

A)  $24x$       B)  $4x^3 + 11$       C)  $4x^3 + x$       D)  $24x + 6$       E) none of these

18. Evaluate:  $f(x) = \frac{d}{dx} \left( \int_x^1 \sin(t^2) dt \right)$

A)  $-\cos(x^2)+1$       B)  $-\sin(x^2)$       C)  $2x \cdot \cos(x)$       D) 0      E) none of these

19. If  $y(t) = t^2 + \frac{2}{2t-1}$  and  $x(t) = 2t + 6$  for what values of x does  $y(x)$  not exist?

A) It exist for all reals      B)  $\frac{1}{2}$       C) 7      D) 6      E) none of these

20. An ant farm initially contains 100 ants. Every week 20% of the population wander off, get lost, and never return. However, 25 new baby ants are born each week. In the long term, at what number will the ant population stabilize?

A) 125      B) 120      C) 105      D) 0      E) none of these

## SCHOLARSHIP TEST 2016 ANSWER KEY

1. B
2. E
3. C
4. D
5. A
6. C
7. A
8. C
9. D
10. D
11. B
12. C
13. A
14. A
15. B
16. A
17. B
18. B
19. C
20. A