Online Scholarship Exam in Math

2020

1. Evaluate the following integral $\int_{0}^{\infty} xe^{-2x}dx$.

(a) 1/4
(b) 1/2
(c) -1/2
(d) -1/4
(e) 1

2. Let $f(x) = x\ln(x+1) + 2\sin x$. Find the derivative $f'(x)$ at $x = 0$.
(a) -2
(b) 0
(c) -1
(d) 1
(e) 2

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3. Find the derivative of the function $f(x) = \dfrac{\sqrt{x}}{x^2 + 1}$ at $x = 1$

(a) $1/4$
(b) 1/2
(c) 1
(d) -1/2
(e) -1/4

4. Find the level of output minimizing average variable cost for the following total cost function: $TC = 40 + 5q - 6q^2 + q^3$
(a) 2
(b) 3
(c) 4
(d) 5
(e) 6

5. Let X be the random variable that is uniformly distributed on $(0,1)$. Calculate the expected value of X^2, $E(X^2)$.
(a) 1
(b) 1/2

(c) 1/3
(d) 1/4
(e) 2/3

6. How many different signals, each consisting of 6 flags hung in a line, can be made from a set of 4 white flags and 2 blue flags if all flags of the same color are identical?

(a) 10
(b) 12
(c) 15
(d) 18
(e) 20

7. Suppose cards numbered one through ten are placed in a hat, mixed up, and then one of the cards is drawn. If we are told that the number on the drawn card is at least five, then what is the conditional probability that it is ten?

(a) 1/3
(b) 1/4
(c) 1/5
(d) 1/6
(e) 1/2

8. Find $\lim_{x \to 1} \dfrac{x^3 + 8x^2 - 10x + 1}{x^2 - 3x + 2}$.

(a) $+\infty$
(b) -1
(c) -10
(d) -9
(e) -10

9. Evaluate the following integral: $\int_0^2 \int_0^{3y} y^2 \, dx \, dy$.

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(a) 8/3
(b) 2
(c) 4
(d) 8
(e) 12

10. Given the supply function $q = 10 + \sqrt{p}$ find the price elasticity of supply at $q = 12$.

(a) 1/12

(b) 1/4
(c) 1/3
(d) 1/6
(e) 4/3