theoremTheorem corollary[theorem]Corollary definitionDefinition

Brief Article The Author document

minipage[c]6in 1. Please cross $\times$ the correct answers.

[-2mm]0mm8mm Sign your name:6cm 6cm10=2.2in =0.8cm =1cm =0.4cm=1 Compute the definite integral $\int_0^1 xe^x \, dx =$

1 $e - 1$ e $-e$ -1

Assume a certain amount of money is in a bank account with an annual interest rate of 10% compounded continuously. Compute the number of years it takes until the amount triples.

$10 \ln 3$ 10 17 20 $5 \ln 3$

Compute the improper integral

$$\int_2^\infty x^{-4} \, dx.$$

124 13 18 -112 -16

A company determines that its marginal profit function is $MP(x) = -300x^2 + 600x + 400$. If the company makes \$300 when it sells 2 items, what is the total profit function?

$-100x^3 + 300x^2 + 400x - 900$ $-100x^3 + 300x^2 + 400x$ $-100x^3 + 300x^2 + 400x + 300$ $-100x^3 + 300x^2 + 400x + 150$ $-100x^3 + 300x^2 + 400x - 750$

Solve the following differential equation with given initial condition:
$$y' = 13y - 1, \quad y(0) = 1.$$

$f(t) = 3 - 2e^{13t}$ $f(t) = 4 - 2e^{13t}$ $f(t) = 3 - 12e^{13t}$ $f(t) = 3 - e^{12t}$ $f(t) = 5 - e^{3t}$

Assume $y' = t^3$ and $y(0) = 1$. Compute $y(2)$.

5 3 9 0 12

Find the equation of the plane through the points $(3,0,0)$,$(0,4,0)$ and $(0,0,2)$.

$4x + 3y + 6z = 12$ $x + 34y + 2z = 3$ $8x + 4y + 2z = 8$ $13x + 14y + 12z = 0$ $16x + 13y + 12z = 4$

For what value of k does the following system of equations have **no solution**?
$$arrayrcl9x - 6y = -31$$

$k = 10$ $k = -10$ $k = 231$ $k = 90$ $k = 23$

Determine which of the following functions is a solution of the differential equation $y'' - 6y' + 8y = 0$.

e^{4t} e^{8t} e^{5t} e^{6t} e^{-5t}

A continuous random variable X has a probability density function $f(x) = 38x^2$ for $0 \leq x \leq 2$. What is the expected value $E(X)$?

32 316 1 52 43

Find the line of least squares $y = ax + b$ which best fits the data points $(-3, -5)$, $(1, 3)$ and $(2, 5)$.

$y = 2x + 1$ $y = 3x + 2$ $y = x + 1$ $y = 5x + 4$ $y = 3x$

Consider the function $f(x, y) = -6x^2 - 7xy - 2y^2$. Then one has:

$(0,0)$ is a saddle point. $(0,0)$ is a relative minimum. $(0,0)$ is a relative maximum. The second derivative test is inconclusive. There are no critical points.

Let X be a discrete random variable whose distribution is given by

$$array|c|c|c|c|c|c|c|c|x2468101214$$

Compute the Variance $\text{Var}(X)$.

485 275 365 125 325

Let Z have the standard normal distribution. Compute $\Pr(1 \leq Z)$.

0.3413 0.500 0.1587 0.8413 0.6742

(13 pts) The demand curve of a certain item is $p = D(q) = 100q + 1$ and its supply curve is $p = S(q) = q + 1$.

(6 pts) Find the equilibrium price p_e and equilibrium quantity q_e. *8cm

(6 pts) Compute the producer surplus.

*8cm

(13 pts) A person opens an Individual Retirement Account (IRA) with the initial amount of $50,000. Then $6,000 per year is deposited in this IRA in a uniform and continuous manner. Assume that the interest rate is 7.5% compounded continuously.

(4 pts) Model this problem as a Calculus problem by finding a **differential equation** and an **initial condition** describing the amount of money, $M(t)$, in the IRA at any time t.

*4cm

(5 pts) Solve the obtained differential equation, i.e. find $M(t)$ at any time t.

*8cm

(4 pts) Compute the balance in the IRA after 20 years. (If you do not have a calculator you can approximate $e^{1.5}$ with 4.5).

*4cm

(13 pts) The Cobb-Douglas production function for a certain product is given by $f(x,y) = 5x^{35}y^{25}$ where $f(x,y)$ is the quantity produced, x denotes units of labor force and y denotes units of capital. Assume that each unit of labor costs \$400, each unit of capital costs \$100, and the total budget is \$20,000. Find the amounts of labor and capital which will maximize the company's production while keeping within the constraints of the budget.

*15cm

Answer: [-3mm]0cm8mm$x = $ 2cm $y =$2cm

(13 pts) A bank has 1,000,000 credit card holders. During the preceding year the average billing to each card holder was \$195 and the standard deviation was \$60. It is assumed that the billings are normally distributed. Compute the number of customers whose bill exceeds \$300.

*18cm

Answer: [-3mm]0cm8mmNumber=2cm

3