PShaji_Assignment15

WebTest Name- (Test)

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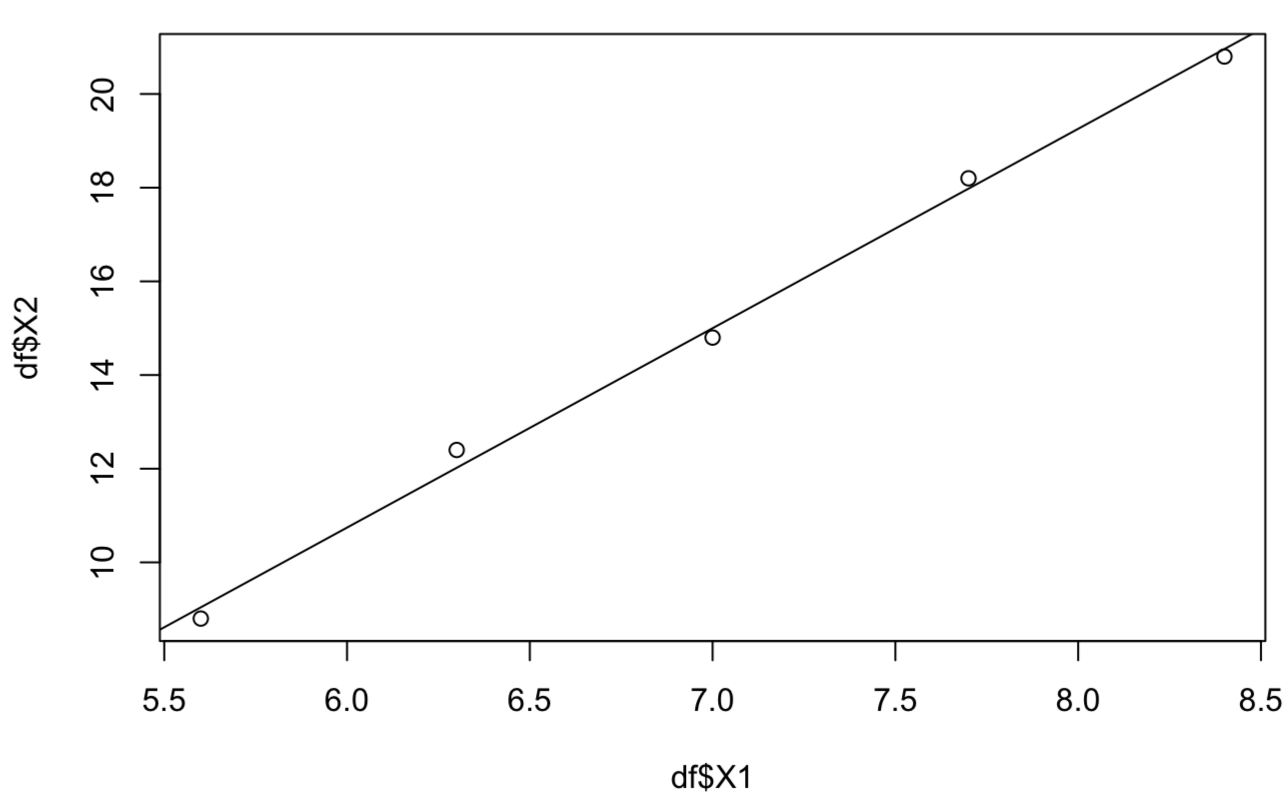
1. Find the equation of the regression line for the given points. Round any final values to the nearest hundredth, if necessary. (5.6,8.8), (6.3,12.4), (7,14.8), (7.7,18.2), (8.4,20.8)

Answer 1)

```
df = data.frame(rbind(c( 5.6, 8.8 ), c( 6.3, 12.4 ), c( 7, 14.8 ), c( 7.7, 18.2 ), c( 8.4, 20.8 )))
```

```
model <- lm(df$X2 ~ df$X1, df)
plot(df$X2~df$X1,data=df)
abline(model)
```



We use lm() function to find the regression line in the given points. The data is then plotted to show the fit.

2. Find all local maxima, local minima, and saddle points for the function given below. Write your answer(s) in the form (x, y, z). Separate multiple points with a comma.

$f(x,y) = 24x - 6xy^2 - 8y^3$

Answer 2)

Let us find the first and second partial derivatives:

$df/dx = 24 - 6y^2 df/dy = -12xy - 24y^2$

$d^2f/dx = 0 d^2f/dy = -12x - 48y$

$df/dx = 24 - 6y^2 = 0 -> 4 - y^2 = 0 df/dy = -12xy - 24y^2 = 0 -> -xy - 2y^2 = 0$

y=+/-2. when y=2 and x=-4 and when y=-2 then x=4.

Therefore, the points are (4,-2) and (-4,2).

$for(4,-2) f(x,y) = 24*4 - 6*4*(-2)^2 - 8(-2)^3 = 64$

which is > 0$

$for(-4,2) f(x,y) = 24*-4 - (6*-4*(2)^2) - 8(2)^3 = -64$

which is < 0$

So only (-4,2) is the saddle point.

3. A grocery store sells two brands of a product, the “house” brand and a “name” brand. The manager estimates that if she sells the “house” brand for x dollars and the “name” brand for y dollars, she will be able to sell 81 - 21x + 17y units of the “house” brand and 40 + 11x - 23y units of the “name” brand.

Step 1. Find the revenue function R (x, y).

Answer 3)

House brand: R(x)=x∗(81−21x+17y)

Name brand: R(y)=y∗(40+11x−23y)

total_revenue = $R(x,y) = x*(81 - 21x + 17y) + y*(40 + 11x - 23y) -> -21x^2 - 23y^2 + 28xy + 81x + 40y$

Step 2. What is the revenue if she sells the “house” brand for $2.30 and the “name” brand for $4.10?

```
x = 2.3
y = 4.1
total_revenue <- -21*x^2 - 23*y^2 + 28*x*y + 81*x + 40*y

print(total_revenue)
```

```
## [1] 116.62
```

Therefore,

we get $116.62 if they sell at $2.3 and $4.1

4. A company has a plant in Los Angeles and a plant in Denver. The firm is committed to produce a total of 96 units of a product each week. The total weekly cost is given by C(x,y)= 1x2 + 1y2 +7x+25y+700, where x is the number of 66 units produced in Los Angeles and y is the number of units produced in Denver. How many units should be produced in each plant to minimize the total weekly cost?

Answer 4)

x+y=96

Therefore, Let’s substitute y = 96−x

reducing the C(x,y) gives us $x^2 - 50*x + 4636$

Solving the first derivative gives x=75

which means that y=21. LA must produce 75 units and Denver 21 to reduce the total weekly costs.

5. Evaluate the double integral on the given region. $\int\int(e^{8x+3y})dA; R: 2 <= x <= 4 and 2 <= y <= 4$

Write your answer in exact form without decimals.

Answer 5)

$y = 2^{y=4} x = 2^{x=4}(e^{8x+3y})dxdy$

$= \int_2^4 \int_2^4 (e^{8x}e^{3y})dxdy$

$= \int_2^4 1/8e^{3y+32} - 1/8e^{3y+16} dy$

$= \int_2^4 1/8(e^{16} - 1)e^{3y+16} dy$

$= (e^4 4 - e^2 8)/24 - (e^{38} - e^{22})/24$

$= 1/24(e^{22} - e^{28} - e^{38} + e^{44})$