**Calculus Basics**

Finish off toy example:

E = e^x – 1

x = log(1+E)

assuming f = 1 + E = e^x :

df/dx = e^x. dx/dE = 1/(1+E) = 1/e^x. . Confirmed

10 calculus problems in the book.

1. f(x) = .

Finding df/dx. where u = x^2 + 1. du/dx = 2x

\* chain rule using change of variable.

2. h(x) = sin(x^2)

Using g(x) = x^2. We have the form f(g(x)) where f = sin(x).

h’(x) = f’(g(x)) \* g’(x).

\* simple chain rule in the form of f(g(x)).

3.

Set u = 3^x^2. du/dx = 3^x^2 \* ln(3) \* 2x. Note. d(2^x)/dx = 2^x \* ln(2). Using this I applied the chain rule.

Next we want to find f’(x). where u = 3^x^2. We already found du/dx.

Now .

Putting them together

\* Complicated chain rule in a function that required another chain rule using change of variables.

4.

Using simple chain rule:

Therefore (

\* Direct chain rule application using e^x functions.

Because I took math 53 I will exercise chain rule and change of variables in more than 1 variable. Note I will use the notation d instead of the partial derivative notation because of Microsoft words capabilities.

5. z = x^2 + y^2 + xy, x = sin(t), y = e^t.

Finding dz/dt.

Putting them together:

\* didn’t bother with the simplification. Simple chain rule with variable changes from x and y to t with multivariable.

5. Find dz/ds.

.

6. Same problem as 5 but finding dz/dt.

. ,

.

\* problem 5 and 6 shows that using same problem but since x and y were in terms of two different variables, you can find different derivatives with respect to different variables using chain rule and change of variables.

7. . Find dw/dt

.

.

use the fact that x^2 + y^2 + z^2 = 1 + tan^2(t) (identity of sin^2(x) + cos^2(x) = 1)

. =

\* shows complex differentiation using trigonometric chain rule problems in three variables. This show that chain rule can be applied in this format for as many variables as we want.

**My Toy Example**

. using simple partial fraction we get c1 = c2 = ½

.

so

Now to create my own toy example I will find

Let f = 2E and hence I will prove this equals 2.

. (after quotient rule simplification)

. (after applying chain rule to ln functions)

. Proven.