MA 213 Worksheet #12

Section 14.5
10/04/18

1 Use the Chain Rule to find dz/dt.

14.5.1 $z = xy^3 - x^2y$ $\quad x = t^2 + 1$ $\quad y = t^2 - 1$

14.5.3 $z = \sin(x)\cos(y)$ $\quad x = \sqrt{t}$ $\quad y = 1/t$

2 *14.5.11* Use the Chain Rule to find $\partial z/\partial s$ and $\partial z/\partial t$.

$z = e^r \cos(\theta)$ $\quad r = st$ $\quad \theta = \sqrt{s^2 + t^2}$

3 *14.5.15* Suppose f is a differentiable function of x and y, and $g(u, v) = f(e^u + \sin(v), e^u + \cos(v))$. Use the table of values to calculate $g_u(0, 0)$ and $g_v(0, 0)$.

	f	g	f_x	f_y
$(0, 0)$	3	6	4	8
$(1, 2)$	6	3	2	5

4 *14.5.23* Use the Chain Rule to find $\dfrac{\partial w}{\partial r}$ and $\dfrac{\partial w}{\partial \theta}$ when $r = 2$, $\theta = \pi/2$.

$w = xy + yz + zx$ $\quad x = r\cos(\theta)$ $\quad y = r\sin(\theta)$ $\quad z = r\theta$

5 Find $\partial z/\partial x$ and $\partial z/\partial y$ (assuming z is implicitly a function of x and y).

14.5.31 $x^2 + 2y^2 + 3z^2 = 1$

14.5.33 $e^z = xyz$

6 *14.5.39* Due to strange and difficult-to-explain circumstances, the length ℓ, width w, and height h of a box change with time. At a certain instant the dimensions are $\ell = 1$ m and $w = h = 2$ m, and ℓ and w are increasing at a rate of 2 m/s while h is decreasing at a rate of 3 m/s . At that instant find the rates at which the following quantities are changing.

a The volume

b The surface area

c The length of a diagonal