??

$\frac{d}{dx}\Big(f\big(g(x)\big)\Big) =$
$\big(g(x)\big)g'(x)$
$t =$
$g(x)$

$$\frac{df}{dx} = \frac{df}{dt}\frac{dt}{dx}.$$

$_{c}hain Multivariable Chain Rule, Part I Let, and, where, and are differentiable functions. Then$
$()$ $is a function of, and \frac{dz}{dt} =$
$\frac{df}{dt} =$
$f_x(x,y)\frac{dx}{dt} +$
$f_y(x,y)\frac{dy}{dt}$
$=$
$\frac{\partial f}{\partial x}\frac{dx}{dt} +$
$\frac{\partial f}{\partial y}\frac{dy}{dt}.$

$_{m}chain1$**Using the Multivariable Chain Rule**Let^2y+
x
$x =$
$\sin t$
$y =$
e^{5t}
$\frac{dz}{dt}$
??

$$f_x(x,y) = 2xy{+}1 f_y(x,y) = x^2\frac{dx}{dt} = \cos t\frac{dy}{dt} = 5e^{5t}.$$

$$\frac{dz}{dt} = (2xy{+}1)\cos t{+}5x^2e^{5t}.$$

$\frac{dz}{dt}$
x
y
t
x
y
t
$\frac{dz}{dt}$
t
x
$\sin t$
y
e^{5t}

$$\frac{dz}{dt} = (2xy{+}1)\cos t{+}5x^2e^{5t} = (2\sin(t)e^{5t}{+}1)\cos t{+}5e^{5t}\sin^2 t.$$

x
y
$\frac{dz}{dt}$
t
z
t
$z =$
x^2y+
$x =$
$(\sin t)^2e^{5t}+$
$\sin t.$

$$\frac{dz}{dt} = 2\sin t\cos t\, e^{5t}{+}5\sin^2 t\, e^{5t}{+}\cos t,$$

$z =$
$f(x,y)$
$x =$
$g(t)$
$y =$
$h(t)$
we
do
not
$know$
$what$
$f,$
g
and/or
h
are

$_{m}chain2$**Applying the Multivariable Chain Rule**$Consider the surface^2+$
y^2-
xy
x
y
$x =$
$\cos t$
$y =$
$\sin t$
$\frac{dz}{dt}$
$t =$