EC140 Formula Sheet

Short table of derivatives

$f(x)$	$f'(x)$	$f(x)$	$f'(x)$
c	0	e^x	e^x
x^n	nx^{n-1}	$\ln(x)$	$1/x$
$e^{g(x)}$	$g'(x)e^{g(x)}$	$\ln g(x)$	$g'(x)/g(x)$
$cg(x)$	$cg'(x)$	$g(x)+h(x)$	$g'(x)+h'(x)$
$g(x)h(x)$	$g'(x)h(x)+g(x)h'(x)$	$g(x)/h(x)$	$[g'(x)h(x)-g(x)h'(x)]/[h(x)^2]$
$g(u(x))$	$g'(u(x))\cdot u'(x)$	$f(u(x),v(x))$	$f_u(u,v)u'(x)+f_v(u,v)v'(x)$

Elasticity:

$$El_x f = \frac{df(x)}{dx}\frac{x}{f(x)} = \frac{d\ln[f(x)]}{d\ln(x)}$$

n-th order Taylor approximation of $f(x)$ around x_0:

$$f(x) \approx f(x_0) + \frac{f'(x_0)}{1!}(x-x_0) + \frac{f''(x_0)}{2!}(x-x_0)^2 + \cdots + \frac{f^{(n)}(x_0)}{n!}(x-x_0)^n$$

Homogeneous function of degree k: $f(tx,ty) = t^k f(x,y), \forall t>0$

Homothetic function: if $f(x_1,y_1) = f(x_2,y_2)$ then $f(tx_1,ty_1) = f(tx_2,ty_2), \forall t>0$

Leibniz' rule:

$$\frac{d}{dt}\left[\int_{a(t)}^{b(t)} f(t,x)dx\right] = \int_{a(t)}^{b(t)} f_t(t,x)dx + f(t,b(t))b'(t) - f(t,a(t))a'(t)$$

Compounding growth formulas: $y_t = (1+g)^t y_0, \quad y_t = (1+g_n)^{tn} y_0, \quad y(t) = e^{gt}y(0)$

Geometric series:

$$\sum_{k=0}^{n-1} aR^k = a\frac{1-R^n}{1-R}$$