

Calculus Review (9/8 Revision)

In calculus, you should have learned that the exponential function is its own derivative. In other words, if $x = e^t$,

$$\dot{x} = \frac{d(e^t)}{dt} = e^t = x.$$

Therefore, by the Chain Rule we have that if $y = e^{\lambda t}$,

$$\dot{y} = \frac{d(e^{\lambda t})}{dt} = \lambda e^{\lambda t} = \lambda y.$$

In MATH 242 we used the method of partial fractions to do integration. In particular, suppose we wanted to integrate

$$\int \frac{dx}{(c_1x + c_2)(c_3x + c_4)},$$

where the c_j are all known constants. We rewrite the integrand as

$$\frac{1}{(c_1x + c_2)(c_3x + c_4)} = \frac{A}{c_1x + c_2} + \frac{B}{c_3x + c_4},$$

since the right-hand side is easy to integrate. To find the unknown constants A and B , we multiply both sides by the denominator of the right-hand side, yielding

$$1 = (\text{coefficients of } x)x + (\text{constants}).$$

Setting the coefficients of x equal to zero and the constants equal to 1 will yield two equations that can be solved for A and B .

We will also be using the following Taylor series this semester:

$$e^z = \sum_{n=0}^{\infty} \frac{z^n}{n!},$$
$$\sin z = \sum_{m=0}^{\infty} \frac{(-1)^m z^{2m+1}}{(2m+1)!},$$
$$\cos z = \sum_{m=0}^{\infty} \frac{(-1)^m z^{2m}}{(2m)!}.$$

