# COM 1021 Revision Suggestions

Clearly you should revise **all** the material we have covered in lectures, the material in the algebra, functions and differentiation booklets being essentially background.

You should in addition pay particular attention to

### Functions

- range and domain
- odd and even, periodic, inverses
- graphs and transforming graphs

### Equations

- Fining the equation of a straight line
- solving quadratic equations

### Trigonometry

- radian measure
- Pythagoras, definitions of trig functions
- expansions of $\sin A \pm B$ and $\cos A \pm B$

### Differentiation

- product, quotient and chain rules
- finding and characterising maxima and minima
- the Newton Raphson method

### Series

- Binomial series, Maclaurin series

### Financial mathematics

- compound interest and investment
- savings accounts
- mortgages and loans

**COM 1021 Mathematical Methods for Computing I**

# Formula Sheet

- **Binomial Theorem:**

  If $n$ is a positive integer then

$$(a+b)^n = a^n + na^{n-1}b + \frac{n(n-1)}{2!}a^{n-2}b^2 + \cdots + b^n$$

- **Maclaurin's Series**

$$f(x) = f(0) + xf'(0) + \frac{x^2}{2!}f''(0) + \frac{x^3}{3!}f'''(0) + ....$$

- **Rules of differentiation:**

$$\text{Sum rule:} \quad \frac{d}{dx}[u(x)+v(x)] = \frac{du}{dx} + \frac{dv}{dx}$$

$$\text{Constants rule:} \quad \frac{d}{dx}[cu(x)] = c\frac{du}{dx}, \quad c \text{ constant}$$

$$\text{Product rule:} \quad \frac{d}{dx}[u(x)v(x)] = u(x)\frac{dv}{dx} + v(x)\frac{du}{dx}$$

$$\text{Quotient rule:} \quad \frac{d}{dx}\left[\frac{u(x)}{v(x)}\right] = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{v(x)^2}$$

Chain rule: If $y = f(g(x))$, write $y = f(u)$, $u = g(x)$ and then

$$\frac{dy}{dx} = \frac{dy}{du}\,\frac{du}{dx}$$

- **Derivatives of particular functions:**

$$\frac{d}{dx}x^n = nx^{n-1}, \quad \frac{d}{dx}\sin x = \cos x, \quad \frac{d}{dx}\cos x = -\sin x, \quad \frac{d}{dx}e^x = e^x, \quad \frac{d}{dx}\ln x = \frac{1}{x}$$

- **Trigonometric identities:**

$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$

- **Savings Account Formula:**

  After $m$ periods with a payment of $P$ per period, with interest rate $r$ per period, the account holds an amount

$$P(1+r)\frac{(1+r)^m - 1}{r}.$$

- **The Mortgage Formula:**

  If a debt $D$ is to be paid off by making $m$ regular payments $P$ when the interest rate is $r$ per period, then

$$P = \frac{rD(1+r)^m}{(1+r)^m - 1}.$$

  After $m$ payments have been made the loan outstanding is $V$ where

$$V = D(1+r)^m - \frac{P\left((1+r)^m - 1\right)}{r},$$