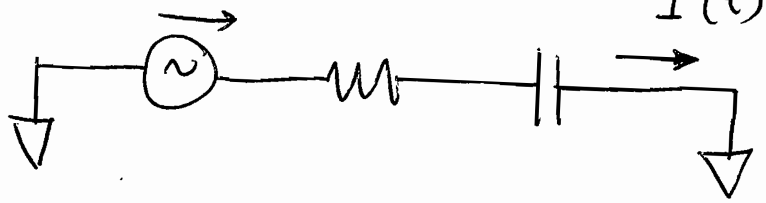
1. $V(t) = V_0 e^{i\omega t}$ $\qquad I(t) = I_0(\omega)\, \cancel{\cos\omega t}\, e^{i\omega t}$



Find the complex number $I_0(\omega)$ using $Z_R = R$ $\quad Z_C = \frac{1}{i\omega C}$ $\quad Z_L = i\omega L$ and Ohm's Law for Impedence.

2. Find roots of $z^4 = 1$

3. Use Taylor expansion to prove Euler's formula.

4. How many roots will $z^5 + 2z^3 - 1 = 0$ have? i.e. 5th order polynomial.

5. Use Euler's formula to express $\cos 2\theta$ as a function of $\cos\theta$ & $\sin\theta$.

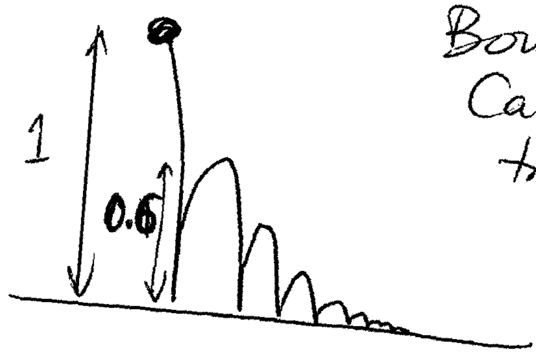
6. Find the real & Imaginary parts of $\ln(1-i)$

7. What values of x will satisfy

$$\cosh x - 5\sinh x - 5 = 0$$

(8) Calculate $\displaystyle\sum_{n=100}^{200} 2n$

(9)

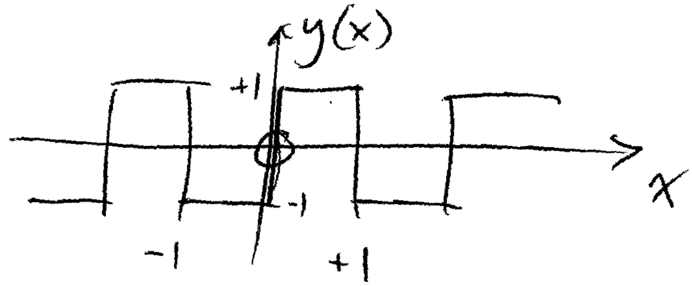


Bouncing ball:
Calculate total distance traveled in vertical direction (use infinite sum).

(10) Review the convergence tests.

(11) Expand $(1+x)^{1/2}$ into a Taylor series.

(12) Find ~~an~~ the Fourier series for



(13) Solve the simultaneous eqns

$$3x_1 + 2x_2 = 3 \quad \text{— (1)}$$
$$4x_1 + 3x_2 = 6 \quad \text{— (2)}$$

(Easiest to ~~sub~~ rearrange (1) & sub into (2)).

(14) $\vec{v} = \begin{bmatrix} 1 \\ 7 \\ 2 \end{bmatrix}$ calculate $|\vec{v}|$

(15) Find the Rank of $A = \begin{bmatrix} 1 & 0 & 1 \\ 3 & 0 & 3 \\ 1 & -1 & 0 \end{bmatrix}$

using det A & a determinant of a submatrix of A.

(16) Find eigenvalues and 3 orthonormal eigenvectors of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 1 & -3 \\ 3 & -3 & -3 \end{bmatrix}$

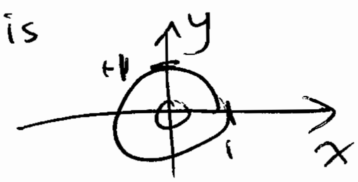
(17) Find the inverse of $A = \begin{bmatrix} 2 & 4 & 3 \\ 1 & -2 & -2 \\ -3 & 3 & 2 \end{bmatrix}$

(18) Form an orthonormal basis that includes $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ and linear combinations of $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ & $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$.

(19) $\phi(x,y,z) = r\sin\theta$

Calculate $\nabla\phi$ in sperical coords.

(20) Calculate $\oint_C x\,dy$ where the contour is



Circle centered at origin radius $= 1$.

(21) Find the most general sol^n of

a) $\dfrac{dy}{dx} - xy - x = 0$ [seperable ODE]

b) $x\dfrac{dy}{dx} + 3x + y = 0$ [Exact ODE]

c) $\dfrac{dy}{dx} = \dfrac{-2}{y} - \dfrac{3y}{2x}$ [Inexact]

d) $\dfrac{dy}{dx} + \dfrac{y}{x} = 2x^3y^4$ [Bernoulli's]

(22) How many linear indep fns $z(x)$ do you expect to find that satisfy

$$\frac{d^4z}{dx^4} = kz \quad ?$$

(23) Use the Wronskian method to show that sin x & cos x are linearly indep.

(24) Find the most general solⁿ $f(t)$ that satisfies:

a) $$\frac{d^2f}{dt^2} + 8\frac{df}{dt} + 12f = 12e^{-4t}$$

(for homogeneous case try $e^{\lambda t}$)

b) $$\frac{d^2f}{dt^2} - 4\frac{df}{dt} + 6f = 0$$

(25) Use variation of parameters to find the most general solⁿ for

$$y'' + y = \frac{1}{\sin x}$$

(26) Use series soln $\sum_{n=0}^{\infty} a_n z^n$ to solve

$$y'' + y = 0$$

(27) Legendre Eqn is

$$y'' - \frac{2x}{1-x^2} y' + \frac{l(l+1)}{1-x^2} y = 0$$

Find the recursion relation for a_n when $l = 1$.

Write an explicit soln $y(x)$ when $l = 1$, and test this soln in the ODE.

(28) Find the most general soln to

(i) $$\frac{\partial^2 u}{\partial t^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial x^2}$$

(ii) $$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 6(x+y)$$

(iii) $$x \frac{\partial u}{\partial x} - 2y \frac{\partial u}{\partial y} = 0$$ where $u = 2y+1$ on the line $x = 1$.