1. Evaluate the following integrals:

(i) $\int (x+1) \sin(x^2+2x+2)\, dx$

(ii) $\int_0^1 x e^x\, dx$

(iii) $\int x \sin^{-1} x\, dx$

(iv) $\int \tan^8 x \sec^4 x\, dx$

(v) $\int \cos^4 x\, dx$

(vi) $\int \frac{1}{\sqrt{x^2+1}}\, dx$

(vii) $\int \frac{x^3}{x^2+2x+2}\, dx$

(viii) $\int \frac{\sin\theta - \cos\theta}{\cos\theta \sin\theta}\, d\theta$

2. Evaluate the integrals:

(i) $\int \frac{x+2}{x(x^2-1)}\,dx$

(ii) $\int \frac{dx}{(x^2+4)^2}$

(iii) $\int \frac{x^2+2x+1}{\sqrt{3-x^2-2x}}\,dx$

(iv) $\int_0^1 \ln x\,dx$

(v) $\int_1^\infty \frac{1}{2x^2+x}\,dx$

3. Let C be the curve given parametrically by $x(t) = 2t^3$, $y(t) = 3t^2$ for $t \in [-1, 2]$.

Calculate ~~the~~ derivatives – express as a function of t.

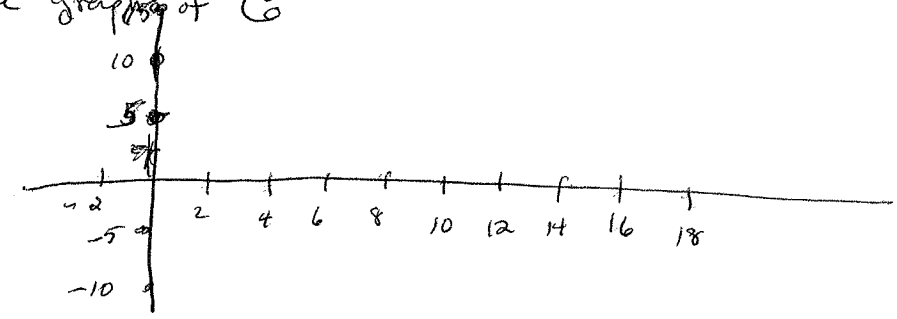
(i) $dy/dx =$

(ii) $\frac{d^2y}{dx^2} =$

(iii) Fill in the chart:

t	-1	0	1	2
x				
y				

(iv) Sketch the graph of C



(v) Find the area of the region bounded between C, the x-axis, $x = -1$ and $x = 2$.

(vi) Calculate the arc length of C.

4. (c) If $\{a_n\}_{n=0}^{\infty}$ is a sequence of real numbers and L is a real number, what is the definition of $\lim_{n\to\infty} a_n = L$?

(i) $a_n = \tan^{-1} n$.

(ii) Show a_n is an increasing sequence.

(iii) If it exists, what is $\lim_{n\to\infty} a_n$?