Note Title 1/22/2019

(1) $y(x) = 2x^2 + 3 \Rightarrow \frac{dy(x)}{dx} = 4x$

(2) $y(x) = \frac{2x}{(x+3)^2} \Rightarrow \frac{dy(x)}{dx} = \frac{(x+3)^2(2) - (2x)(2(x+3)(1))}{(x+3)^4}$

$f(x)^n \Rightarrow \frac{d}{dx} f(x)^n = n f(x)^{n-1} f'(x)$

$(x+3)^2 \Rightarrow \frac{d}{dx}(x+3)^2 = 2(x+3)^{2-1}(1) = 2(x+3)$

$$\frac{dy(x)}{dx} = \frac{2(x+3)^2 - 4x(x+3)}{(x+3)^4}$$

(3) $f(x) = x(x+2)^2$

(a) $\frac{df(x)}{dx} = (1)(x+2)^2 + x(2(x+2))$

$= (x+2)^2 + 2x(x+2) = x^2 + 4x + 4 + 2x^2 + 4x$

$= 3x^2 + 8x + 4$

(b) $f(x) = x^3 + 4x^2 + 4x$

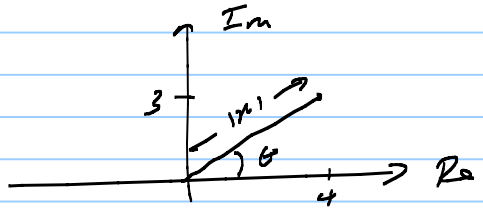
$\frac{df(x)}{dx} = 3x^2 + 8x + 4$

(4) $j = \sqrt{-1}$; $j^2 = -1$

$f(w) = \frac{jw}{a+jw} \Rightarrow \frac{df(w)}{dw} = \frac{(a+jw)(j) - (jw)(j)}{(a+jw)^2}$

$= \frac{aj - w + w}{(a+jw)^2} = \frac{aj}{(a+jw)^2}$

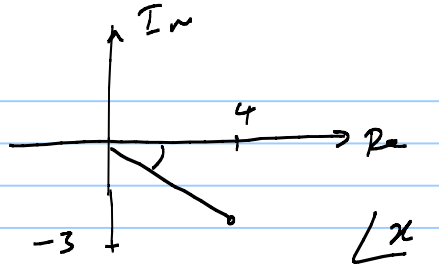
(5) $x = 4 + j3$



$|x| = \sqrt{16+9} = 5$

$\angle x = \tan^{-1}\left(\frac{3}{4}\right)$

(6) $x = 4 - j3$

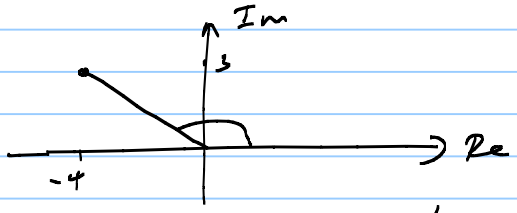


$|x| = \sqrt{16+9} = 5$

$\angle x = \tan^{-1}\left(\frac{-3}{4}\right)$

(7) $x = -4 + j3$

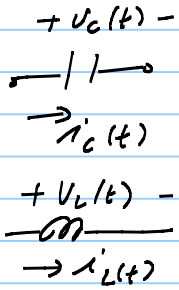
$= -(4 - j3)$



$|x| = \sqrt{16+9} = 5$

$\angle x = \tan^{-1}\left(-\frac{3}{4}\right) \pm 180^\circ$

(8)



$i_c(t) = C \frac{dv_c(t)}{dt}$

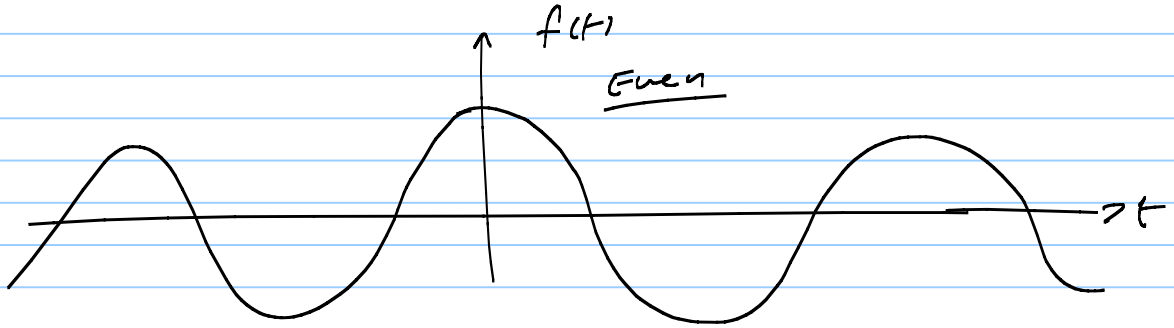
$v_L(t) = L \frac{di_L(t)}{dt}$

(9)

$\int u\,dv = uv - \int v\,du$

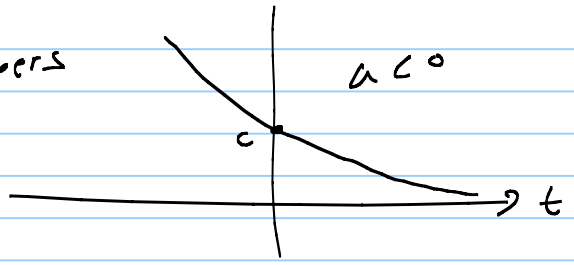
(10)





(i)

$x(t) = Ce^{at}$, a and c are real numbers



If a is complex

$$x(t) = 5e^{-j2t} = 5(\cos(2t) - j\sin(2t))$$
$$= 5[\cos(-2t) + j\sin(-2t))$$

