Complex numbers Ex 13.1 Q3(iv)

$$i^5 + i^{10} + i^{15} = i^{4\times1} \times i^1 + i^{4\times2} \times i^2 + i^{4\times3} \times i^3$$
$$= 1 \times i + 1 \times i^2 + 1 \times i^3$$
$$= i - 1 - i$$
$$= -1$$

$$\therefore i^5 + i^{10} + i^{15} = -1$$

Complex numbers Ex 13.1 Q3(v)

$$\frac{i^{592} + i^{590} + i^{588} + i^{586} + i^{584}}{i^{582} + i^{580} + i^{578} + i^{576} + i^{574}} = \frac{i^{4\times148} + i^{147} \times i^2 + i^{4\times147} + i^{4\times146} \times i^2 + i^{4\times146}}{i^{4\times145} \times i^2 + i^{4\times145} + i^{4\times144} \times i^2 + i^{4\times144} + i^{4\times143} \times i^2}$$
$$= \frac{1 + 1 \times i^2 + 1 + 1 \times i^2 + 1}{1 \times i^2 + 1 + 1 \times i^2 + 1 + 1 \times i^2}$$
$$= \frac{1 - 1 + 1 - 1 + 1}{-1 + 1 - 1 + 1 - 1}$$
$$= \frac{1}{-1}$$
$$= -1$$

$$\therefore \frac{i^{592} + i^{590} + i^{588} + i^{586} + i^{584}}{i^{582} + i^{580} + i^{578} + i^{576} + i^{574}} = -1$$

Complex numbers Ex 13.1 Q3(vi)

$$1 + i^2 + i^4 + i^6 + i^8 + \ldots + i^{20}$$
$$= 1 + i^2 + i^4 + i^{4\times1} \times i^2 + i^{4\times2} + i^{4\times2} \times i^2 + i^{4\times3} + i^{4\times3} \times i^2 + i^{4\times4} + i^{4\times4} \times i^2 + i^{4\times5}$$
$$= 1 - 1 + 1 + 1 \times i^2 + 1 + 1 \times i^2 + 1 + 1 \times i^2 + 1 + 1 \times i^2 + 1$$
$$= 1 - 1 + 1 - 1 + 1 - 1 + 1 - 1 + 1 - 1 + 1$$
$$= 1$$

Complex numbers Ex 13.1 Q3(vii)

$$(1+i)^6 + (1-i)^3 = \left[(1+i)^2\right]^3 + (1-i)^3$$
$$= \left(1 + i^2 + 2i\right)^3 + \left(1 - 3i + 3i^2 - i^3\right)$$
$$= \left(1 - 1 + 2i\right)^3 + \left(1 - 3i - 3 + i\right)$$
$$= 8i^3 - 2 - 2i$$
$$= -8i - 2 - 2i$$
$$= -2 - 10i$$

********** END **********