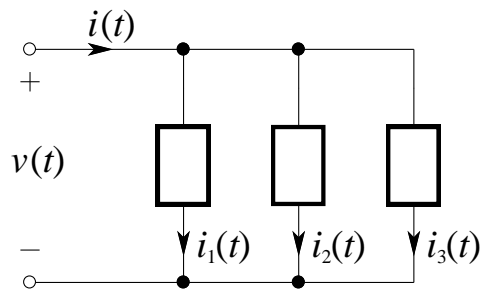# 10 Phasors

1.

Consider three loads connected in parallel across a 230 V (RMS) 50 Hz line as shown below:

The load currents are:

$$i_1(t) = 10\cos(314t - 30°)\,\text{A}$$
$$i_2(t) = 5\sin(314t + 150°)\,\text{A}$$
$$i_3(t) = -7\cos(314t + 20°)\,\text{A}$$

a) Find the current $i(t)$, expressing your answer in the form:

$$i(t) = I_{max}\cos(\omega t + \theta)\,\text{A}$$

b) Show that at $t = 5\,\text{ms}$ the instantaneous value of i equals the algebraic sum of the instantaneous currents i_1, i_2 and i_3.

2.

a) Solve the equation $x^2 + 3x + 4 = 0$, expressing the roots in rectangular, polar and exponential forms.

b) Evaluate $3\angle 68° - 2\angle - 40°$ and express your answer in the polar form.

c) Evaluate $\dfrac{(3 + j4)(5\angle - 60°)}{(1 + j2)}$ and express the answer in rectangular form.

d) Evaluate $(1 - j2)^{10}$.

e) Evaluate $\sqrt{(-3 + j4)}$ and express the two roots in polar form.

f) Evaluate $\dfrac{14 + j20 - 10\angle 90°}{3 + j4} + 12\angle - 60°$.