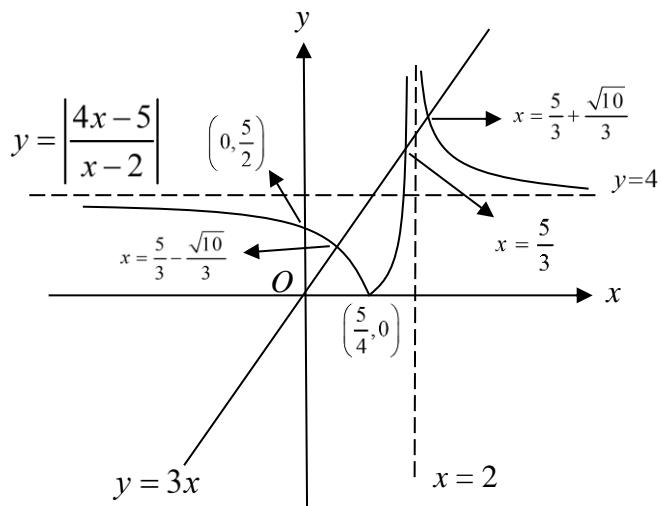


<b>Qn</b>	<b>Solution</b>
1(i)	
(ii)	$\lambda = \pm 3\sqrt{3}$
2(i)	$\frac{3}{2r+1} - \frac{4}{2r+3} + \frac{1}{2r+5}$ $= \frac{8r+28}{(2r+1)(2r+3)(2r+5)}$
(ii)	$\frac{2}{3} + \frac{1}{4} \left( \frac{1}{2n+5} - \frac{3}{2n+3} \right)$
(iii)	<p>When <math>n \rightarrow \infty</math>, <math>\frac{1}{2n+5} \rightarrow 0</math>, <math>\frac{3}{2n+3} \rightarrow 0</math>,</p> $\sum_{r=0}^{\infty} \frac{2r+7}{(2r+1)(2r+3)(2r+5)} = \frac{2}{3}$ which is a finite number. Therefore the series is convergent. Sum to infinity = $\frac{2}{3}$
3(i)	$b = -a$ , $c = 3a$ , $d = 5a$
(ii)	$d < -1.63$ or $d > 3$
(iii)	<p>The graph shows a function with a vertical asymptote at <math>x = -k</math>. The curve approaches negative infinity as <math>x</math> approaches <math>-k</math> from the left. It has a local minimum at the point <math>\left(0, \frac{1}{k}\right)</math>. The curve then rises, crossing the <math>x</math>-axis at two points, and approaches the <math>x</math>-axis as <math>x</math> goes to positive infinity.</p>
4(i)	$x = -1$ (rejected $\because x \geq 0$ ) or $\frac{5}{3}$ or $x = \frac{10 \pm \sqrt{10^2 - 4(3)(5)}}{6}$ $= \frac{10 \pm \sqrt{40}}{6}$ $= \frac{5}{3} \pm \frac{\sqrt{10}}{3}$

(ii)



$$\left| \frac{5-4x}{3x-6} \right| > x$$

$$\left| \frac{(-1)(4x-5)}{3(x-2)} \right| > x$$

$$\left| \frac{4x-5}{x-2} \right| > 3x$$

From the graphs,

$$x < \frac{5}{3} - \frac{\sqrt{10}}{3} \text{ or } \frac{5}{3} < x < 2 \text{ or } 2 < x < \frac{5}{3} + \frac{\sqrt{10}}{3}$$

5(i)

$$\frac{h}{x} = \frac{\sqrt{3}L}{2R}$$

6(i)

(ii) Equation of tangent at  $y = 2$ 

$$y = -4kx + 2\ln 2 + 2$$

6(ii)

(iii) Angle between  $y$ -axis and the tangent in (ii)  
 $\approx 14.0^\circ$ 

7(i)

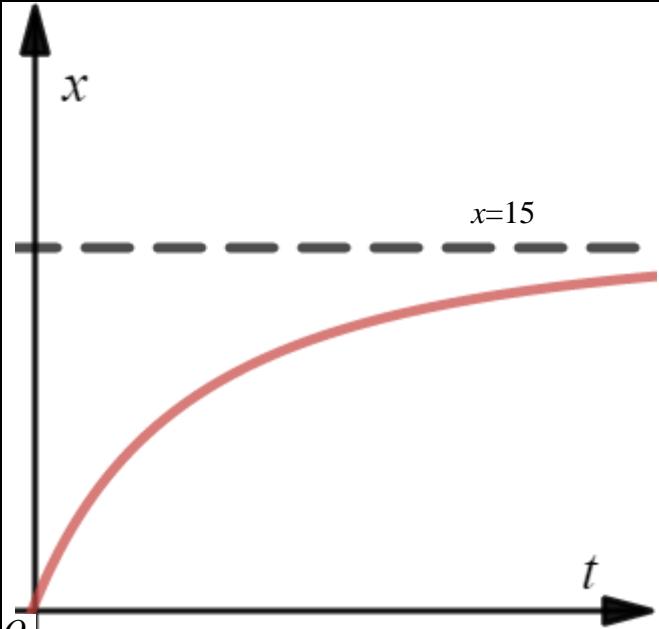
$$\begin{aligned} (ii) \quad f^{-1}g(x) &= f^{-1}(3 + e^{-x}) \\ &= -\frac{3}{2} - \sqrt{e^{-x} + \frac{17}{4}} \end{aligned}$$

$$D_{f^{-1}g} = D_g = \mathbb{R}$$

$$(iii) \quad \therefore k = -1$$

8(a)  
(i)

8(a) (ii)	$e^{\frac{\tan^{-1}x}{2}} = 1 + x\left(\frac{1}{2}\right) + \frac{x^2}{2!}\left(\frac{1}{4}\right) + \dots$ $= 1 + \frac{1}{2}x + \frac{1}{8}x^2 + \dots$
(b)	$g(x) = \frac{1}{\sqrt{2} \cos\left(\frac{x}{a} + \frac{\pi}{4}\right)}$ $\approx 1 + \frac{1}{a}x + \frac{3}{2a^2}x^2$
9(i)	
(ii)	$\frac{14a\pi}{3}$
(iii)	$b = 3 \tan \frac{7a}{90}$
10(i) (a)	Distance she runs in the 15th session = 2937.19 metres
(b)	Least $n = 32$ She needs a minimum of 32 sessions.

(c)	Wendie's average speed of the 33rd session first exceeds 220 metres per minute.
(ii)	$x=16.02$
(iii)	
11(i)	$\therefore \frac{dx}{dt} = 0.008(15-x)(25-x)$
(ii)	$x = \frac{75(1-e^{0.08t})}{3-5e^{0.08t}}$ OR $x = \frac{75(e^{-0.08t}-1)}{3e^{-0.08t}-5}$
(iii)	
(iv)	$t = 4.2059 = 4.21$ (3 s.f.)
(v)	<p><b>Method 1:</b>      From graph, when <math>t \rightarrow \infty, x \rightarrow 15</math>      For large values of <math>t</math>, the mass of X increases and approaches to a limit of 15 grams</p> <p><b>Method 2:</b>  <math display="block">x = \frac{75(e^{-0.08t}-1)}{3e^{-0.08t}-5}</math>      When <math>t \rightarrow \infty, x \rightarrow 15</math>      For large values of <math>t</math>, the mass of X increases and approaches to a limit of 15 grams</p>