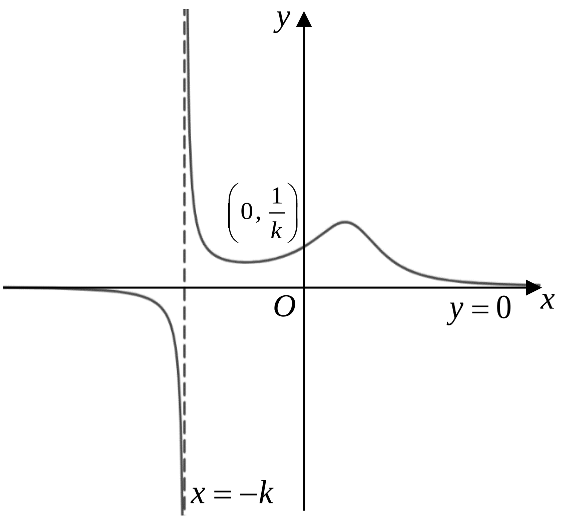
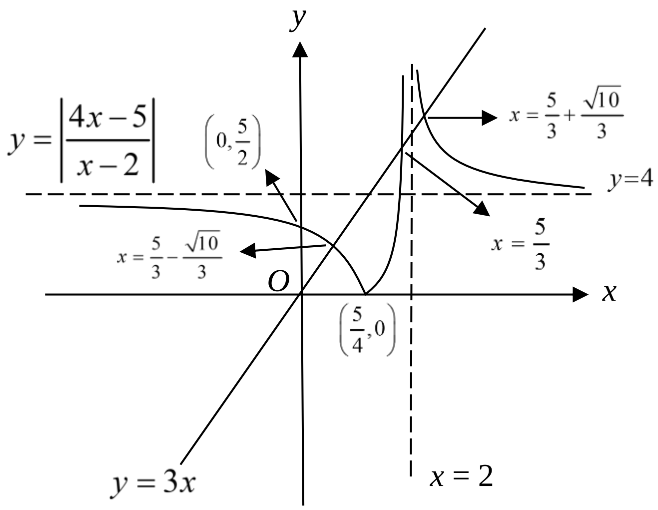
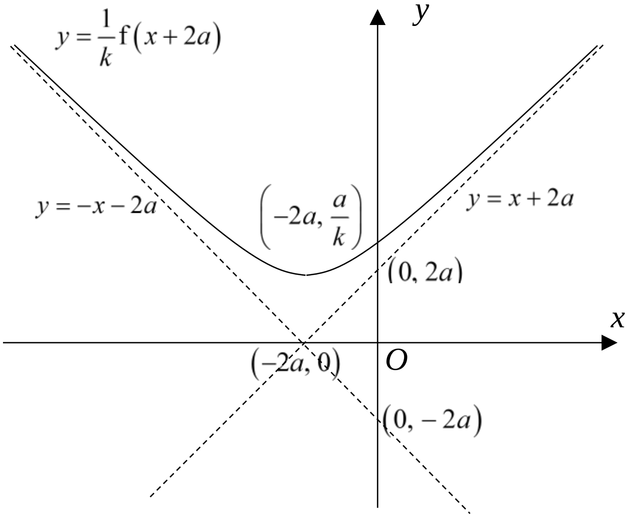
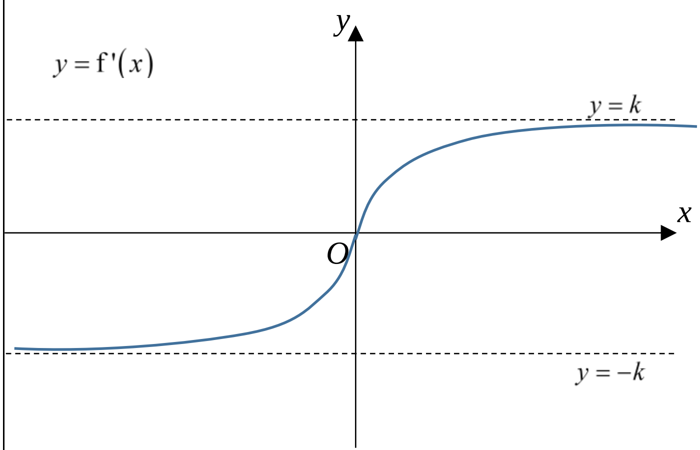
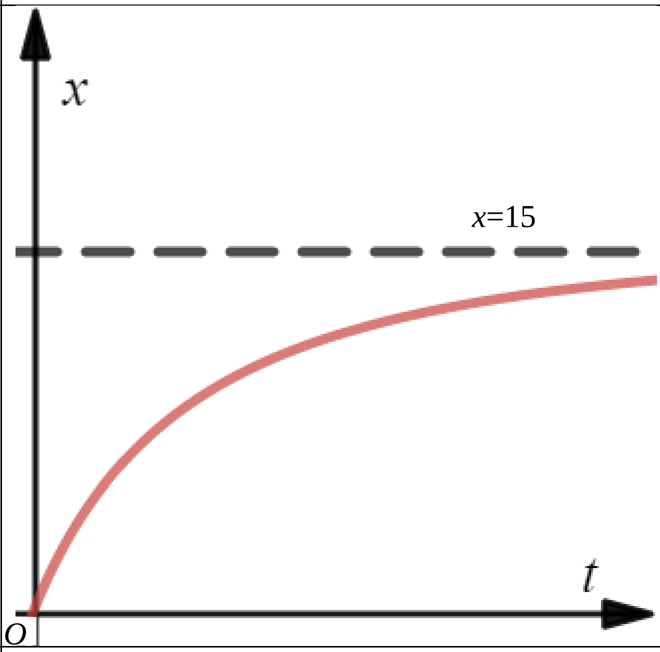
Qn	Solution
1(i)	
(ii)	$\lambda = \pm 3\sqrt{3}$
2(i)	$\dfrac{3}{2r+1} - \dfrac{4}{2r+3} + \dfrac{1}{2r+5}$ $= \dfrac{8r+28}{(2r+1)(2r+3)(2r+5)}$
(ii)	$\dfrac{2}{3} + \dfrac{1}{4}\left(\dfrac{1}{2n+5} - \dfrac{3}{2n+3}\right)$
(iii)	When $n \to \infty, \dfrac{1}{2n+5} \to 0, \dfrac{3}{2n+3} \to 0$, $\displaystyle\sum_{r=0}^{\infty} \frac{2r+7}{(2r+1)(2r+3)(2r+5)} = \frac{2}{3}$ which is a finite number. Therefore the series is convergent. Sum to infinity = $\dfrac{2}{3}$
3(i)	$b = -a,\ c = 3a,\ d = 5a$
(ii)	$d < -1.63$ or $d > 3$
(iii)	
4(i)	$x = -1$ (rejected $\because x \geq 0$) or $\dfrac{5}{3}$ or $x = \dfrac{10 \pm \sqrt{10^2 - 4(3)(5)}}{6}$ $= \dfrac{10 \pm \sqrt{40}}{6}$ $= \dfrac{5}{3} \pm \dfrac{\sqrt{10}}{3}$

(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, $x<\frac{5}{3}-\frac{\sqrt{10}}{3}$ or $\frac{5}{3}<x<2$ or $2<x<\frac{5}{3}+\frac{\sqrt{10}}{3}$
5(i)	
(ii)	$\frac{h}{x}=\frac{\sqrt{3}L}{2R}$
6(i)	
(ii)	Equation of tangent at $y = 2$ $y=-4kx+2\ln 2+2$
(iii)	Angle between y-axis and the tangent in **(ii)** $\approx 14.0°$
7(i)	
(ii)	$\mathrm{f}^{-1}\mathrm{g}(x)=\mathrm{f}^{-1}\left(3+e^{-x}\right)$ $=-\frac{3}{2}-\sqrt{e^{-x}+\frac{17}{4}}$ $\mathrm{D}_{\mathrm{f}^{-1}\mathrm{g}}=\mathrm{D}_{\mathrm{g}}=\mathbb{R}$
(iii)	$\therefore\quad k=-1$
8(a) (i)	

8(a) (ii)	$\mathrm{e}^{\tan^{-1}\frac{x}{2}} = 1 + x\left(\frac{1}{2}\right) + \frac{x^2}{2!}\left(\frac{1}{4}\right) + \dots$ $= 1 + \frac{1}{2}x + \frac{1}{8}x^2 + \dots$
(b)	$\mathrm{g}(x) = \dfrac{1}{\sqrt{2}\cos\left(\frac{x}{a} + \frac{\pi}{4}\right)}$ $\approx 1 + \frac{1}{a}x + \frac{3}{2a^2}x^2$
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)	**Method 1:** From graph, when $t \to \infty$, $x \to 15$ For large values of t, the mass of X increases and approaches to a limit of 15 grams **Method 2:** $x = \frac{75(e^{-0.08t}-1)}{3e^{-0.08t}-5}$ When $t \to \infty$, $x \to 15$ For large values of t, the mass of X increases and approaches to a limit of 15 grams