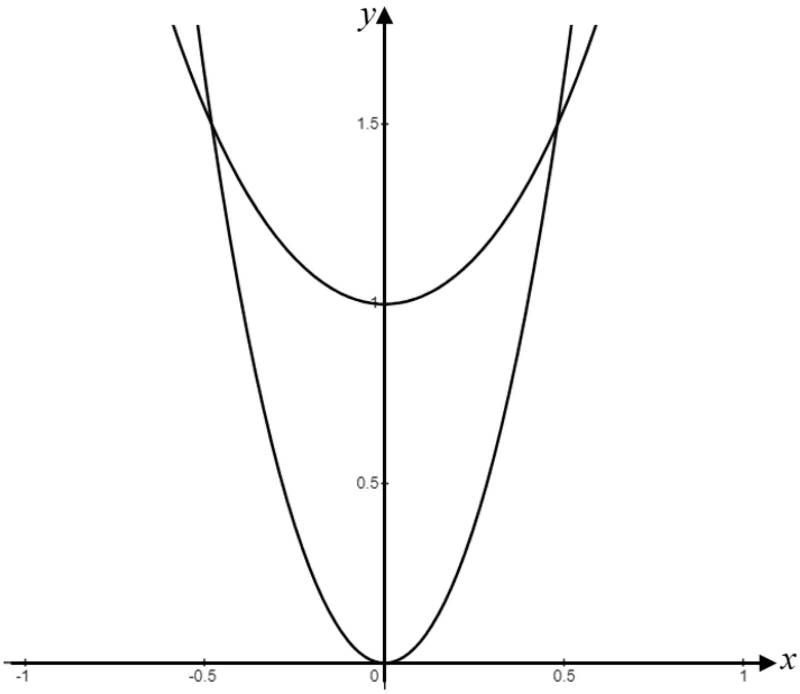
1(b)	$I_2 = \cosh 1 - 2\sinh 1 + 2I_0$
	$I_2 = 3\cosh 1 - 2\sinh 1 - 2$
2(a)	$1 + 2\sinh^2 x = 6\sinh^2 x \Rightarrow \sinh x = \pm\frac{1}{2}$
	$x = \sinh^{-1}\left(\pm\frac{1}{2}\right) = \ln\left(\pm\frac{1}{2} + \sqrt{\frac{1}{4}+1}\right)$
	$x = \ln\left(\pm\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)$

2(b)	

3(a)	$\sin 5\theta = \mathrm{Im}\left(\cos\theta + \mathrm{i}\sin\theta\right)^5 = \sin^5\theta - 10\sin^3\theta\cos^2\theta + 5\sin\theta\cos^4\theta$
	$= \sin^5\theta - 10\sin^3\theta\left(1-\sin^2\theta\right) + 5\sin\theta\left(1-\sin^2\theta\right)^2$
	$= 16\sin^5\theta - 20\sin^3\theta + 5\sin\theta$
3(b)	$x = \sin\theta, \quad \sin 5\theta = \frac{1}{2}\sqrt{3}$
	$5\theta = \frac{1}{3}\pi + 2k\pi$ or $5\theta = \frac{2}{3}\pi + 2k\pi$
	$\sin\left(\frac{1}{15}\pi\right)$
	$\sin(\frac{2}{15}\pi), \sin(-\frac{5}{15}\pi), \sin(-\frac{4}{15}\pi), \sin(\frac{7}{15}\pi)$

4(a)	$\int_0^1 \frac{1}{2}\left(3^x\right)\mathrm{d}x < \frac{1}{2}\left(\left(\frac{1}{N}\right)3^{\frac{1}{N}} + \left(\frac{1}{N}\right)3^{\frac{2}{N}} + \cdots + \left(\frac{1}{N}\right)3^{\frac{N-1}{N}} + \left(\frac{1}{N}\right)3^{\frac{N}{N}}\right)$
	$= \frac{1}{2N}\sum_{n=1}^{N}\left(3^{\frac{1}{N}}\right)^n = \frac{3^{\frac{1}{N}}}{N\left(3^{\frac{1}{N}}-1\right)}$
4(b)	$\int_0^1 \frac{1}{2}\left(3^x\right)\mathrm{d}x > \frac{1}{2}\left(\left(\frac{1}{N}\right) + \left(\frac{1}{N}\right)3^{\frac{1}{N}} + \cdots + \left(\frac{1}{N}\right)3^{\frac{N-2}{N}} + \left(\frac{1}{N}\right)3^{\frac{N-1}{N}}\right)$
	$= \frac{1}{2N}\sum_{n=0}^{N-1}\left(3^{\frac{1}{N}}\right)^n = \frac{1}{N\left(3^{\frac{1}{N}}-1\right)}$
4(c)	$\frac{3^{\frac{1}{N}}}{N\left(3^{\frac{1}{N}}-1\right)} - \frac{1}{N\left(3^{\frac{1}{N}}-1\right)} = \frac{1}{N}$
	$\frac{1}{N} \to 0$ as $N \to \infty$.

5(a)	$m^2+m+1=0 \Rightarrow m=-\frac{1}{2}\pm\frac{1}{2}\sqrt{3}$
	$y=e^{-\frac{1}{2}x}\left(A\cos\frac{\sqrt{3}}{2}x+B\sin\frac{\sqrt{3}}{2}x\right)$
	$y=p\sin 2x+q\cos 2x \Rightarrow y'=2p\cos 2x-2q\sin 2x \Rightarrow y''=-4p\sin 2x-4q\cos 2x$
	$-4p-2q+p=1$ $\quad$ $-4q+2p+q=1$
	$p=-\frac{1}{13}$ $\quad$ $q=-\frac{5}{13}$
	$y=e^{-\frac{1}{2}x}\left(A\cos\frac{\sqrt{3}}{2}x+B\sin\frac{\sqrt{3}}{2}x\right)-\frac{1}{13}\sin 2x-\frac{5}{13}\cos 2x$
5(b)	$y\approx-\frac{1}{13}\sin 2x-\frac{5}{13}\cos 2x=\sqrt{\frac{2}{13}}\left(-\frac{1}{\sqrt{26}}\sin 2x-\frac{5}{\sqrt{26}}\cos 2x\right)$
	$\sqrt{\frac{2}{13}}\sin(2x-1.77)$

6	$\int \frac{1+x}{1-2x-x^2}\,dx = -\frac{1}{2}\ln\left(1-2x-x^2\right)$
	$e^{-\frac{1}{2}\ln\left(1-2x-x^2\right)} = \frac{1}{\sqrt{1-2x-x^2}}$
	$\frac{d}{dx}\left(\frac{y}{\sqrt{1-2x-x^2}}\right) = \frac{1}{\sqrt{1-2x-x^2}}$
	$1-2x-x^2 = 2-\left(x+1\right)^2$
	$\int \frac{1}{\sqrt{2-\left(x+1\right)^2}}\,dx = \sin^{-1}\left(\frac{x+1}{\sqrt{2}}\right)+C$
	$\pi = \sin^{-1}\frac{1}{\sqrt{2}}+C \Rightarrow C = \frac{3}{4}\pi$
	$\frac{y}{\sqrt{1-2x-x^2}} = \sin^{-1}\left(\frac{x+1}{\sqrt{2}}\right)+\frac{3}{4}\pi$

7(a)(i)	$\dot{x} = 4\dfrac{\sec^2 \frac{1}{2}t}{\tan\frac{1}{2}t} + 3\operatorname{cosec}^2 t - 3$ $\dot{x} = 8\operatorname{cosec} t + 3\operatorname{cosec}^2 t - 3 = 8\operatorname{cosec} t + 3\cot^2 t$
7(a)(ii)	$\dot{y} = 6\operatorname{cosec} t - 4\cot^2 t$
7(a)(iii)	$\dot{x}^2 + \dot{y}^2 = \left(8\operatorname{cosec} t + 3\cot^2 t\right)^2 + \left(6\operatorname{cosec} t - 4\cot^2 t\right)^2$ $= 100\operatorname{cosec}^2 t + 25\cot^4 t = 100\operatorname{cosec}^2 t + 25\left(\operatorname{cosec}^2 t - 1\right)^2$ $= 25\operatorname{cosec}^4 t + 50\operatorname{cosec}^2 t + 25$
	$= 25\left(\operatorname{cosec}^2 t + 1\right)^2$
	$5\int_{\frac{1}{6}\pi}^{\frac{1}{3}\pi} \operatorname{cosec}^2 t + 1\,\mathrm{d}t = 5\left[-\cot t + t\right]_{\frac{1}{6}\pi}^{\frac{1}{3}\pi} = 5\left(-\frac{1}{\sqrt{3}} + \frac{1}{3}\pi + \sqrt{3} - \frac{1}{6}\pi\right) = \frac{5}{6}\pi + \frac{10}{3}\sqrt{3}$

7(b)	$\dfrac{\dot{y}}{\dot{x}} = \dfrac{6\operatorname{cosec} t - 4\cot^2 t}{8\operatorname{cosec} t + 3\cot^2 t} = \dfrac{6\sin t - 4\cos^2 t}{8\sin t + 3\cos^2 t} = \dfrac{6\sec t - 4\cot t}{8\sec t + 3\cot t}$
	$\dfrac{\mathrm{d}}{\mathrm{d}t}\left(\dfrac{6\operatorname{cosec} t - 4\cot^2 t}{8\operatorname{cosec} t + 3\cot^2 t}\right)$ $= \dfrac{\left(8\csc t + 3\cot^2 t\right)\left(-6\cot t\csc t + 8\cot t\csc^2 t\right) + \left(6\csc t - 4\cot^2 t\right)\left(6\csc^2 t\cot t + 8\cot t\csc t\right)}{\left(8\operatorname{cosec} t + 3\cot^2 t\right)^2}$ or $\dfrac{\mathrm{d}}{\mathrm{d}t}\left(\dfrac{6\sin t - 4\cos^2 t}{8\sin t + 3\cos^2 t}\right)$ $= \dfrac{\left(8\sin t + 3\cos^2 t\right)\left(6\cos t + 8\cos t\sin t\right) - \left(6\sin t - 4\cos^2 t\right)\left(8\cos t - 6\cos t\sin t\right)}{\left(8\sin t + 3\cos^2 t\right)^2}$
	$\dfrac{100\cos t\sin^2 t + 50\cos^3 t}{\left(8\sin t + 3\cos^2 t\right)^2} = \dfrac{50\cos t\left(\sin^2 t + 1\right)}{\left(8\sin t + 3\cos^2 t\right)^2} = \dfrac{50\cot t\operatorname{cosec} t\left(\operatorname{cosec}^2 t + 1\right)}{\left(8\operatorname{cosec} t + 3\cot^2 t\right)^2}$
	$\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2} = \dfrac{\mathrm{d}}{\mathrm{d}t}\left(\dfrac{6\sin t - 4\cos^2 t}{8\sin t + 3\cos^2 t}\right) \times \dfrac{\mathrm{d}t}{\mathrm{d}x} = \dfrac{50\sin^2 t\cos t\left(\sin^2 t + 1\right)}{\left(8\sin t + 3\cos^2 t\right)^3}$ $= \dfrac{50\cot t\operatorname{cosec} t\left(\operatorname{cosec}^2 t + 1\right)}{\left(8\operatorname{cosec} t + 3\cot^2 t\right)^3}$

8(a)	$\begin{vmatrix} 5 & a & 0 \\ 20 & -5 & 0 \\ 2 & -3 & 1 \end{vmatrix} = -20a - 25$
	$a \neq -\frac{5}{4}$
	Three planes intersect at a *single* point.