1.1: 2

1.2: e^2

1.3: (-2,3)

1.4: $-\frac{2}{e}$

1.5: 2

1.6: 1

1.7: $\frac{1}{3}$ ArcTan[3 e^x] + C

1.8: 4

1.9: 1

1.10:0

1.11: $\begin{pmatrix} -bc+ad & 0 \\ 0 & -bc+ad \end{pmatrix}$

1.12:2

2.1 $\lim_{x\to\pi}\frac{\tan x-\sin x}{\pi-x} \overset{\text{罗比达法则}}{=} \lim_{x\to\pi}\frac{\sec^2(x)-\cos(x)}{-1} = -2$

2.2 $f'(x) = -2x+x^2$ 有两个零点，即 $x_1=0$, $x_2=2$

	(-∞,0)	0	(0,2)	2	(2,+∞)
f′(x)	+	0	-	0	+
f(x)	↗	1/3	↘	-1	↗

所以单增区间：(-∞,0] 和 [2,+∞)， 单减区间 [0,2]， 在 x=0 时取得极大值 1/3， x=2 时取得极小值 -1.

2.3 $\int\frac{\sqrt{x}}{1-x}dx \overset{x=t^2}{=} \int\frac{2t^2}{1-t^2}dt = \int\frac{2t^2-2+2}{1-t^2}dt = \int\left(\frac{2}{1-t^2}-2\right)dt = -2t+\int\left(\frac{1}{1-t}+\frac{1}{1+t}\right)dt$

$= -2t-\ln|1-t|+\ln|1+t|+C = -2\sqrt{x}-\ln\left|1-\sqrt{x}\right|+\ln\left|1+\sqrt{x}\right|+C$

$= -2\sqrt{x}+\ln\left|\frac{1+\sqrt{x}}{1-\sqrt{x}}\right|+C$

2.4 $\int_0^{\pi^2/4}\cos\sqrt{x}\,dx \overset{x=t^2}{=} \int_0^{\pi/2}2t\cos t\,dt = \int_0^{\pi/2}2t\,d(\sin t)$

$= (2t\sin t)\big|_0^{\pi/2} - \int_0^{\pi/2}2\sin t\,dt$

$= \pi + 2(\cos t)\big|_0^{\pi/2} = \pi-2$

2.5 由题意 $A=g(0)=\lim_{x\to0}g(x)=\lim_{x\to0}\frac{f(x)+2\sin x}{x} = \lim_{x\to0}\frac{f(x)-f(0)+2\sin x}{x} = f'(0)+2 = 1+2=3$

2.6 $AX+I=A^2+X \Leftrightarrow (A-I)X = A^2-I = (A-I)(A+I)$

易知 $A-I=\begin{pmatrix}0&0&1\\0&1&0\\1&0&0\end{pmatrix}$可逆，故 原方程的解为：

$X=A+I=\begin{pmatrix}2&0&1\\0&3&0\\1&0&2\end{pmatrix}$

2.7 增广矩阵：$\begin{pmatrix}2&-1&1&-1&2\\1&-2&2&1&4\\1&-3&4&3&8\end{pmatrix} \overset{R_1\leftrightarrow R_2}{\Longrightarrow} \begin{pmatrix}1&-2&2&1&4\\2&-1&1&-1&2\\1&-3&4&3&8\end{pmatrix}$

$\overset{R_2-2R_1}{\Longrightarrow} \begin{pmatrix}1&-2&2&1&4\\0&3&-3&-3&-6\\1&-3&4&3&8\end{pmatrix} \overset{R_3-1R_1}{\Longrightarrow} \begin{pmatrix}1&-2&2&1&4\\0&3&-3&-3&-6\\0&-1&2&2&4\end{pmatrix} \overset{R_2\leftrightarrow R_3}{\Longrightarrow} \begin{pmatrix}1&-2&2&1&4\\0&-1&2&2&4\\0&3&-3&-3&-6\end{pmatrix}$

$$\xrightarrow{-1 R_2} \begin{pmatrix} 1 & -2 & 2 & 1 & 4 \\ 0 & 1 & -2 & -2 & -4 \\ 0 & 3 & -3 & -3 & -6 \end{pmatrix} \xrightarrow{R_1 + 2 R_2} \begin{pmatrix} 1 & 0 & -2 & -3 & -4 \\ 0 & 1 & -2 & -2 & -4 \\ 0 & 3 & -3 & -3 & -6 \end{pmatrix} \xrightarrow{R_3 - 3 R_2} \begin{pmatrix} 1 & 0 & -2 & -3 & -4 \\ 0 & 1 & -2 & -2 & -4 \\ 0 & 0 & 3 & 3 & 6 \end{pmatrix}$$

$$\xrightarrow{\frac{1}{3} R_3} \begin{pmatrix} 1 & 0 & -2 & -3 & -4 \\ 0 & 1 & -2 & -2 & -4 \\ 0 & 0 & 1 & 1 & 2 \end{pmatrix} \xrightarrow{R_1 + 2 R_3} \begin{pmatrix} 1 & 0 & 0 & -1 & 0 \\ 0 & 1 & -2 & -2 & -4 \\ 0 & 0 & 1 & 1 & 2 \end{pmatrix} \xrightarrow{R_2 + 2 R_3} \begin{pmatrix} 1 & 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 2 \end{pmatrix}$$

所以通解为

$x_1 = c,\ x_2 = 0,\ x_3 = 2 - c$

3.1 $f(t) = \lim_{x\to\infty} t\left(1+\frac{1}{x}\right)^{2\,tx} = \lim_{x\to\infty} t\left(\left(1+\frac{1}{x}\right)^{x}\right)^{2t} = t\,e^{2t}$

$f'(t) = (t\,e^{2t})' = e^{2t} + 2\,t\,e^{2t} = e^{2t}(1+2\,t)$

3.2

r (A) + r (B) - r (A + B)	A	r (A)	B	r (B)	A + B	r (A + B)
0	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$	0	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$	0	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$	0
1	$\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$	1	$\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$	1	$\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$	1
2	$\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$	1	$\begin{pmatrix} -1 & 0 \\ 0 & 0 \end{pmatrix}$	1	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$	0
3	$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$	2	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	2	$\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$	1
4	$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$	2	$\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$	2	$\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$	0