1a. $\cot(2B)$

b. ~~$\tan(2x)$~~ $\cos(x)\sec(x) = 1$ $\tan(x) = \tan(x)$

c. $\tan^2 x - \tan x \sec^2 x = -\tan(x)$

2. $\sin^{-1}\sqrt{1-x^2} + \cos^{-1}\sqrt{1-x^2} = \frac{\pi}{2}$

$\sin^{-1}(x) = A$ $\quad x = \sin A$ $\quad \frac{opp}{hyp} = \frac{x}{1} = x$

$\cos^{-1}(x) = B$ $\quad x = \cos B$ $\quad \frac{adj}{Hyp} = \frac{x}{1} = x$

angles in Δ added to π in radians ↑

$90° = \frac{\pi}{2}$ So we need other $90° = (A+B)$

3. $V_1(t) = 5\sin(2t)$

$V_2(t) = 2\cos(2t)$

$(A\sin(\omega t + \phi))$

a. V_1 and $V_2 = 2$

b $V_3 = V_1(t) + 3V_2(t)$

$= 5\sin(2t) + 6\cos(2t)$

$\sin(A+B) = \sin(\omega t + \phi)$

$V_3 = A\sin(\omega t)\cos\phi + A\cos(\omega t)\sin\phi$

$\omega = 2$

$A\sin\phi = 5$

$A\sin\phi = 6$

$\frac{A\sin\phi}{A\cos\phi} = \tan\phi = \frac{5}{3}$

$\phi = \tan^{-1}\left(\frac{5}{3}\right) = 1.03037\ldots$

4. $S_{20} = S_{22}$

$0.1c = -2$

$S_k = \sum_{i=0}^{k-1} a + id \rightarrow \frac{k}{2}(2a + (k-1)d$ $\quad d = -2$

$S_{20} = \frac{20}{2}(2a + (20-1)(-2)$

$= 10(2a + 19 \times -2) = 10(2a - 38)$

$S_{22} = \frac{22}{2}(2a + (22-1)(-2)$

$= 11(2a + 21 \times -2) = 11(2a - 42)$

$S_{22} = S_{20}$ so $11(2a-42) = 10(2a-38)$

$a = 41$

$S_1 = \frac{1}{2}(2(41) + 0 \times -2)$

$S_1 = 41$

Sc $S_n = \frac{a_1(1-r^n)}{1-r}$, $r \neq 1$

So $a = 7$, $r = \frac{3}{4}$

$S_{10} = \frac{7(1-(\frac{3}{4})^{10})}{1-\frac{3}{4}} = 7.54949$

6. $(1+\frac{2}{x})^{\frac{3}{2}} = 1+(\frac{3}{2})(\frac{2}{x}) + \frac{(\frac{3}{2})(\frac{1}{2})}{2}(\frac{2}{x})^2 + \frac{(\frac{3}{2})(\frac{1}{2})(\frac{-1}{2})}{3!}(\frac{2}{x})^3 \ldots$

Converges when $|\frac{2}{x}|<1$

$\therefore -1<\frac{2}{x}<1$

7. $\sin(4x) = 4x - \frac{4x^3}{3!} - \frac{4x^5}{5!}$

8. $\sum_{k=1}^{\infty} \frac{(-1)^k}{(k+1)!} = \frac{-1}{2!} + \frac{1}{3!} + \frac{-1}{4!} + \frac{1}{5!} + \frac{-1}{6!}$

$= -0.5 \quad 0.1666 \quad -0.0416 \quad 0.00833 \quad -0.00138 = -0.3719$

9. a $\lim_{k\to\infty} x[k] = \frac{3k+11}{k+222} = 3$

b. " " $x[k] = (-3)^k = -\infty$

c. " " $x[k] = (-0.4)^k = 0$

10. $f(x) = (x+2)^2$ $\quad f(x) = (y)^2 \quad f(x)' = 2y$

$y = x+2 \quad x' = 1$

$f(x)' = f(y)' \times y' = 2y \times 1$

$= 2(x+2) \times 1$

$= 2x+4$