#1. $y+3 \geq 4y+6$

$-3y+3 \geq 6$

$-3y \geq 3$

$3y \leq -3$

Ans: $y \leq -1$ ✓

#2. Given line $3x+2y=1$ has its slope $-\frac{3}{2}$

Since $2y = -3x+1$

$y = \left(-\frac{3}{2}\right)x + \frac{1}{2}$ ... (1)

The slope of a straight line that is perpendicular to the given line (1) has its slope m satisfying that

$m \cdot \left(-\frac{3}{2}\right) = -1$. Hence $m = \frac{2}{3}$.

Now $\begin{cases} \text{slope } m = \frac{2}{3} \\ \text{point } (1,2) \end{cases} \Rightarrow$ Line $y-2 = \frac{2}{3}(x-1)$

$y = \frac{2}{3}x - \frac{2}{3} + 2$

$y = \frac{2}{3}x + \frac{4}{3}$. ✓

#3. $(x^2-x+1)(x+1)$

$= x^3 - x^2 + x + x^2 - x + 1$

$= x^3 + 1$. ✓

#4. $(-2x^{-2}y^3)^{-3}(4xy)^3 = (-2)^{-3}x^6y^{-9} \cdot 4^3x^3y^3$

$= \frac{x^6 \cdot 4^3x^3y^3}{(-2)^3y^9} = \frac{64x^9}{-8y^6} = \frac{-8x^9}{y^6}$. ✓

#5. $0.\underline{000000108} = 1.08 \times 10^{-7}$ ✓

#6. $27x^6 - 12x^8 = 3x^6(9-4x^2) = 3x^6(3-2x)(3+2x)$ ✓

#7. $x^2+8x = 3$ We will complete the square.

$\Leftrightarrow x^2+8x+16 = 19$

$\Leftrightarrow (x+4)^2 = 19$

$\Leftrightarrow x+4 = \pm\sqrt{19}$

$\Leftrightarrow x = -4 \pm \sqrt{19}$ ✓

#8. $\dfrac{x^2+6x}{x^2+3x-18} - \dfrac{2x-1}{x+6} - \dfrac{x-2}{3-x}$

$= \dfrac{x(x+6)}{(x+6)(x-3)} - \dfrac{2x-1}{x+6}\cdot\dfrac{x-3}{x-3} + \dfrac{x-2}{x-3}\cdot\dfrac{x+6}{x+6}$

$= \dfrac{x^2+6x-(2x^2-x-6x+3)+x^2+4x-12}{(x+6)(x-3)} = \dfrac{14x-15}{(x+6)(x-3)}$ ✓

(minus)

#9. $\dfrac{x^2-8x+15}{x^2+2x-35} \div \dfrac{15-2x-x^2}{x^2+9x+14} = \dfrac{x^2-8x+15}{x^2+2x-35} \times \dfrac{x^2+9x+14}{x^2+2x-15} \times (-1)$

$= \dfrac{(x-5)(x-3)}{(x+7)(x-5)} \cdot \dfrac{(x+2)(x+7)}{(x+5)(x-3)} \times (-1) = -\dfrac{x+2}{x+5}$ ✓

#10. $\dfrac{\frac{1}{y^2} - \frac{1}{xy} - \frac{2}{x^2}}{\frac{1}{y^2} - \frac{3}{xy} + \frac{2}{x^2}} \times x^2y^2 = \dfrac{x^2-xy-2y^2}{x^2-3xy+2y^2}$

$= \dfrac{(x-2y)(x+y)}{(x-2y)(x-y)} = \dfrac{x+y}{x-y}$ ✓

#11. $216^{3x} = 36^{2x+1}$

$\Leftrightarrow (6^3)^{3x} = (6^2)^{2x+1}$

$\Leftrightarrow 6^{9x} = 6^{4x+2}$

$\Leftrightarrow 9x = 4x+2$

$\Leftrightarrow 5x = 2$

$\Leftrightarrow x = \dfrac{2}{5}$ ✓

#12 $f(-1) = 5(-1) - (-1)^3$

$= -5+1 = -4$ ✓

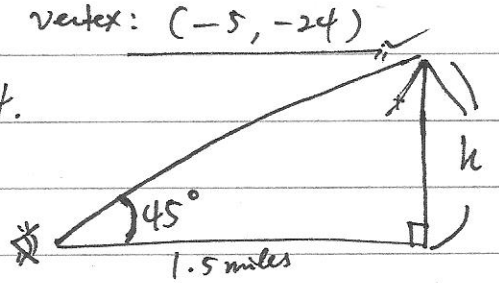
#13. $y = x^2+10x+1$

$= x^2+10x+25-25+1$

$= (x+5)^2 - 24$

vertex: $(-5, -24)$ ✓

#14.



$1 = \tan 45° = \dfrac{h}{1.5\text{miles}}$. So $h = 1.5$ miles ✓

(though it means a bit wierd)

~~(it means height = 1.5 miles)~~

#15. $\dfrac{\log_9 27}{\ln e^5} \overset{*}{=} \dfrac{\log_9 9 + \log_9 3}{5\ln e} = \dfrac{1+\frac{\log_3 3}{\log_3 9}}{5}$

$= \dfrac{1+\frac{1}{2}}{5} = \dfrac{\frac{3}{2}}{5} = \dfrac{3}{10}$ ✓

* In numerator also possible

$\dfrac{\log_3 27}{\log_3 9} = \dfrac{3}{2}$.