Engineering Maths Tutorial 13 (Elec)

1. Expand the following:
   a) $4x(x+2)$
   b) $(x+5)(x-2)$
   c) $(x+2)(x-2)(x-2)$
   d) $x(x+3)^2$

2. Factorise the following:
   a) x^2-7x-8
   b) $7x^2-7x-14$
   c) $x^5-3x^4-28x^3$

3. Simplify the following:
   a) $\frac{(a^4n)^5}{\sqrt[3]{27a^{12}n^{18}}}$
   b) $\frac{8(x^2y)^2}{(2xy^3)^3}$

4. Write as a single logarithm $5\log(7x)-2\log(x^3)+\log(2x)$

5. Solve the following equations
   a) $8^{x-3}=512$
   b) $\log(x^2+199)=4$

6. Rearrange $T=2\pi\sqrt{\frac{I}{mgr}}$ to make g the subject.

7. Solve $Q=re^{t-\sin(H)}$ for t.

8. Solve the following systems of equations

$3x+2y=7$ $\qquad$ $y=2x+3$

$5x+8y=21$ $\qquad$ $12x+y^2=37$

9. Convert 156^0 to radians.

10. Solve the following trigonometric equations for *x* between 0 and 2π $\qquad$ $(0\le x\le 2\pi)$
    a) $25=22-6\sin(x-0.7)$
    b) $5=7+10tan(2x-0.11)$

11. Find the maxima and minima of the curve $y = x^4 - 2x^2 + 1$

12. Find the turning points of $y = \ln(x + 3) - x$ and state their nature.

13. Find the equation of the tangent to $y = \cos(x)$ at the point where $x = \pi$

14. Find the equation of the tangent to $y = 3e^{2x}$ at the point where $x = \ln(3)$

15. Find the equation of each graph below