Extension 1 Calculus Worksheet

1. Use differentiation from first principles to show that d(x)/dx =1.Use mathematical induction and the product rule for differentiation to prove that $d(x^n)/dx = nx^{n-1}$ for all positive integers n.

2. Find $\lim_{x\to 0} (\sin 2x)/x$

3. Differentiate $x\cos^2 x$.

4. Differentiate $\cos^{-1}(3x)$ with respect to x.

5. Evaluate $\int_{-1}^{1} 1/\sqrt{(4-x^2)}\, dx$

6. Evaluate $\int_0^{\pi/4} \cos\theta \sin^2\theta d\theta$

7. A particle moves on the x-axis with velocity v. The particle is initially at rest at x =1. Its acceleration is $x + 4$. Using the fact that acceleration= d/dx{(1/2) v^2 }, find the speed of the particle at x =2.

8. A particle is moving in simple harmonic motion in a straight line. Its maximum speed is $2ms^{-1}$ and its maximum acceleration is $6ms^{-2}$. Find the amplitude and the period of the motion.

9. Evaluate the Given limit: $\lim_{x\to 3} x+3$

10. Differentiate $\tan^{-1}(x^4)$ with respect to x.