Name: _____

Class: _____

Due Date: _____

Physics Topic 1G Math – Derivatives and Integrals

Part 1: Answer the following questions. The solutions to this worksheet can be found on the YouTube channel Go Physics Go.

1. For the following functions determine the derivative of *y*:

   a. $y = 7x^3 + 2x + 3$

   b. $y = 5e^{4x}$

   c. $y = 4\sin(3x)$

   d. $y = 3\cos\left(\frac{x}{6}\right)$

2. Find the maximum and minimum values of y and the values of x at which they occur for the function $y = x^3 - 6x^2 - 15x + 7$.

3. Evaluate the following integrals:

   a. $\int (4x^2 + 3x + 7)dx$

   b. $\int (6x^5 - 4x^3 + 12x)dx$

   c. $\int e^x dx$

   d. $\int e^{6x} dx$

   e. $\int (2x^{-1} + 3x^{-2})dx$

   f. $\int (2x^3 + 5x - 3x^{-1} + 3x^{-4})dx$

   g. $\int (\sin 4x)dx$

   h. $\int (\cos 4x)dx$

   i. $\int \left(\frac{1}{4}\right)(\cos 6x)\, dx$

4. Calculate the area under the curve $y = 4x^2 + 2x$ between $x = +1$ and $x = +3$.

5. Find the average value of $y = 4x^2 + 2x$ between $x = 1$ and $x = 3$.

6. Calculate $\frac{dy}{dx}$ and $\frac{dy}{dt}$ for $y = 8x^2$.

7. Calculate $\frac{dx}{dt}$ and $\frac{dx}{dz}$ for $x = 4\sin 3t$.

8. Calculate $\frac{dx}{dt}$ for the following functions:

   a. $x = 4\sin^5 t$

   b. $x = 2\cos^5(4t^8)$

   c. $x = 2\sin^4[3(t^3 + 4t)^2]$

   d. $x = 5e^{2t}$

   e. $x = 4e^{3t^6}$

   f. $x = 2e^{3(t^5+2t+1)^4}$

   g. $x = e^{4\sin^3(2t^4+t)^5}$