Name: _____ **Derivations Practice**

Part I – Algebra Review

Directions: Solve the following equations for the given variable and conditions. Simplify if needed.

Example: $2x + xy = z$ Solve for x

$x(2 + y) = z$

$x = \frac{z}{2+y}$

1. $v_1 + v_2 = 0$ Solve for v_1

2. $v_f^2 = v_i^2 + 2ax$

   a) Solve for v_i

   b) Solve for x

3. $x_f = x_i + v_o t + \frac{1}{2} at^2$

   a) Solve for v_o

   b) Solve for t if $v_o = 0$

   c) Solve for t if $x_o = x_f$

4. $F = m \frac{v_f - v_i}{t_f - t_i}$

   a) Solve for v_f if $t_i = 0$

   b) Solve for t_f if $v_f = 0$ and $t_i = 0$

5. $a_c = \frac{v^2}{r}$ Solve for v

6. $mgsin\theta = \mu mgcos\theta$ Solve for θ

7. $\frac{1}{2}\, mv_f^2 + mgh_f = \frac{1}{2}\, mv_i^2 + mgh_i$
   a) Solve for h_f if $h_i = 0$ and $v_f = 0$ b) Solve for v_f if $h_f = 0$

8. $Ft = mv_f - mv_i$ Solve for v_f

9. $m_1v_{i,1} + m_2v_{i,2} = (m_1 + m_2)v_f$ Solve for $v_{i,2}$

10. $(F_1 sin\theta)r_1 + (-F_2 sin\emptyset)r_2 = 0$ Solve for r_2

11. $F_g = G\ \frac{m_1 m_2}{r^2}$ Solve for r

12. $L - Lcos\theta = \frac{v^2}{r}$ Solve for L

13. $\frac{mv^2}{R} = G\ \frac{Mm}{R^2}$ Solve for v

14. $T = 2\pi\sqrt{\frac{L}{g}}$ Solve for g

15. $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$ Solve for R_T

Part II – Algebra Review with Substitution

Use the equations in each problem to solve for the specified variable in the given terms. Simplify.

1. $F_f = \mu F_N$ and $F_N = mgcos\theta$ Solve for μ in terms of F_f, m, g, and θ

2. $F_1 + F_2 = F_T$ and $F_1 d_1 = F_2 d_2$ Solve for F_1 in terms of F_T, d_1, and d_2

3. $F_c = ma_c$ and $a_c = \frac{v^2}{r}$ Solve for r in terms of F_C, m, and v

4. $T = 2\pi\sqrt{\frac{L}{g}}$ and $T = \frac{1}{f}$ Solve for L in terms of π, g, and f