You may find it helpful to refer to a Calculus book for the on the differentiation rules and integration techniques.

1. Differentiate the following. Don't forget the chain rule, when needed.

[Do not simplify.]

- (a). $s(t) = 8t^2 4t + 1$
- (b). $y = \sin \omega t$
- (c). $y = te^{3t}$

(d). $f(x) = \frac{\sqrt{x^2 + 1}}{2x^3 - 1}$

- 2. Integrate the following using the stated rule or technique. You must show all your work.
- (a). $\int t^2 3 dt$ [power rule]

(b). $\int \sec^2 x \ dx$ [trig rule]

(c). $\int x\sqrt{x^2+1} dx$ [u-subs.]

(d). $\int xe^{-4x} dx$ [integration by parts]

(e). $\int \frac{1}{x^2 + 9} dx$ [trig. subs.]

(f). $\int \frac{x-1}{x^2+3x+2} dx$ [partial fractions]

3. Integrate the following integrals. Show all your work.

(a).
$$\int \frac{1}{3x-4} dx$$

(b).
$$\int \sin 2x \ dx$$

(c).
$$\int x^2 \cos x \ dx$$

(d).
$$\int \frac{x+1}{\sqrt{4x^2+8x}} dx$$

(e).
$$\int \ln x \ dx$$

(f).
$$\int \tan^2 x \ dx$$