Outcome 2 HOMEWORK

1. Integrate the following with respect to x:

a) $\int \frac{3}{\sqrt{1-x^2}}dx$ b) $\int \frac{1}{2(1+x^2)}dx$ c) $\int_0^{\sqrt{3}} \frac{dx}{\sqrt{4-x^2}}$ d) $\int_0^3 \frac{6}{9+x^2}dx$.

2. Integrate the following with respect to x:

a) $\int \frac{dx}{\sqrt{4-25x^2}}$ b) $\int_0^{\frac{2}{3}} \frac{1}{4+9x^2}dx$.

3. Find

a) $\int \frac{2x^2-2x+3}{(2x-1)(x^2+1)}dx$ b) $\int \frac{47+x-5x^2}{3(x+2)(x-3)^2}dx$ c) $\int \frac{x^3}{x^2-1}dx$.

4. a) Integrate $\int_0^{2\pi} x\sec^2 x \, dx$.

   b) Use integration by parts to integrate $\int 4x^2e^{2x}dx$.

   c) By writing $\tan^{-1} = \tan^{-1} x.1$ find $\int \tan^{-1} xdx$.

   d) Integrate $\int e^{-3x}\sin 4xdx$.

5. The gradient of the tangent to a curve is given by $\frac{dy}{dx} = \frac{-2x}{y}$.

   Find the equation of the curve if it passes through the point (2,0).

6. At any time *t* the amount of active ferment in a culture of yeast is increasing at a rate that is directly proportional to the amount of active ferment already in the culture.

   a) Express this law in the form of a differential equation and solve this equation.

   b) Given that the amount doubles between the times *t* = 0 and *t* = 1, at what time will the amount have four times its original value?

7. A particle moves in a straight line with acceleration $6 - 2v$, where v is its velocity.

   a) If the particle has velocity $v = 1$ initially, find its velocity at time t.

   b) Show that this velocity tends to a limiting value.