LEVEL 2 ANTIDIFFERENTIATION *ANSWERS*

1. Find the equation of the curve which passes through the point (2, 9) and whose gradient is $\frac{dy}{dx} = 2x - 5$

$$y = x^2 - 5x + 15$$

2. Find the equation of the curve $y = f(x)$ if the gradient is $y' = 6x^2 + 8x - 7$ and when $x = 1$, $y = 5$

$$y = 2x^3 + 4x^2 - 7x + 6$$

3. Find the equation of the curve $y = f(x)$ if the gradient is $f'(x) = x^4$ and $f(1) = 0$.
(ie when $x = 1$, $y = 0$)

$$y = \frac{1}{5}x^5 - \frac{1}{5}$$

4. Find the equation of the curve whose gradient function is $\frac{dy}{dx} = x - x^2$
and when $x = 1$, $y = 1$

$$y = \frac{1}{2}x^2 - \frac{1}{3}x^3 + \frac{5}{6}$$

5(a) If the distance of a car from O is $x = 6t^2 + 2t + 1$ find the velocity equation

ie $v = \frac{dx}{dt} = 12t + 2$

and find the acceleration equation.

$ie\ a = \frac{dv}{dt} = 12$

(b) The acceleration of a car is $a = \frac{dv}{dt} = 6t + 1$

(i) Find the Velocity equation given that $v = 4$ m/s when $t = 0$

$$v = 3t^2 + t + 4$$

(ii) Find the displacement equation (ie distance equ) given that when $t = 0$ the distance from O is $x = 2$ m

$$x = t^3 + \frac{1}{2}t^2 + 4t + 2$$

6. $f'(x) = 6x - 12x^2$ and the curve passes through the point (2, 4). Find the equation of the curve $y = f(x)$

$$f(x) = 3x^2 - 4x^3 + 24$$

7. Find the antiderivatives.

(a) $\frac{dy}{dx} = 4x^3 - 7x$

$$= x^4 - \frac{7}{2}x^2 + c$$

(b) $\frac{dy}{dx} = \frac{3x}{2} + \frac{5x^2}{4}$

$$= \frac{3}{4}x^2 + \frac{5}{12}x^3 + c$$

8. (a) The acceleration of an object moving in a line is $a = 6t - 4$
At $t = 0$, the object is at O moving with a velocity of $v = 1$ ms^{-1}
Find the velocity equation at time t sec

$$v = 3t^2 - 4t + 1$$

(b) Find at what times the velocity becomes zero.

$$t = \frac{1}{3}, 1 \text{ seconds}$$