

## Homework 9

1) Express in partial fractions  $\frac{2x^2 - 3x + 2}{x^2(x-1)}$  **5**

2) Given that  $y = \ln(1 + \sin x)$ , where  $0 < x < \frac{\pi}{2}$ , show that  $\frac{d^2y}{dx^2} = \frac{-1}{1 + \sin x}$ . **5**

3) A curve has equation

$$x^2 + 4xy + y^2 + 11 = 0.$$

Find the values of  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at the point  $(-2, 3)$ . **6**

4) When an object is placed on a rotating horizontal disc at a distance of 3 metres from the centre it moves with a speed of  $2\text{ms}^{-1}$ .

When the object is then moved a distance of 1 metre further out from the centre it is on the point of slipping.

Calculate the coefficient of friction. **4**

5) A person stands inside a cylindrical fairground ride which has a radius of 4m. The drum is then rotated and when it gets to a speed of  $19\text{ms}^{-1}$  it is safe for the floor to be lowered and the person remains against the wall.

What is the coefficient of friction between the person and the wall of the cylinder? **4**