Math. 285 **Quiz 2** February 12, 2004

Use both sides of the paper if necessary

(1) Solve the initial value problem:

$$y\frac{dy}{dx} = x^2 \quad , \; y(0) = 1 \; .$$

(2) Find the general solution to:

$$y' + \frac{2}{x}y = \frac{\sin(x)}{x^2} \; .$$

1

The equation is separable:

$$y\,dy = x^2 dx$$

$$\Rightarrow \frac{1}{2}y^2 = \frac{1}{3}x^3 + C$$

If $y(0) = 1$ then

$$\frac{1}{2} \cdot 1 = C$$

i.e. $C = 1/2$

The solution is thus

$$\boxed{y^2 = \frac{2}{3}x^3 + 1}$$

To get $y(0)=1$ we must take

$$\boxed{y = +\sqrt{\frac{2}{3}x^3 + 1}}$$

2

(1st order linear).

Integrating Factor:

$$e^{\int \frac{2}{x}dx} = e^{2\ln x} = x^2$$

Thus we get

$$x^2y' + 2xy = \sin x$$

$$\Rightarrow \frac{d}{dx}(x^2 y) = \sin x$$

$$\Rightarrow x^2 y = -\cos x + C$$

$$\Rightarrow \boxed{y = -\frac{\cos x}{x^2} + \frac{C}{x^2}}$$