1. Show how equation A can be re-arranged to give equation B.

(A) $$y = A^2 e^{\left(\frac{ax^2 - a}{b}\right)}$$

(B) $$a = \frac{b(\ln y - 2\ln A)}{x^2 - 1}$$

2. Solve the simultaneous equations below showing all your working.

$$3x - \frac{y}{2} = 1.5$$

$$y - \frac{x}{2} = 2.5$$

3. Combine the two functions *f(x)* and *g(x)* to give expressions for *f(g(x))* and *g(f(x))*. [5]

$$f(x) = e^{\frac{x^3}{2}}$$

$$g(x) = 2x^{\frac{1}{3}}$$

4. (i) Solve the following quadratic equation by factorising or using the formula given at the top of this exam paper: [5]

$$0 = 2x^2 - x - 6$$

(ii) Sketch the function below marking the points at which it crosses both axes and the coordinates of the maxima/minima. [7.5]

$$y = 2x^2 - x - 6$$

5. For the function $f(x) = 2e^{\left(\frac{1}{x^2-1}\right)}$ evaluate the following limits:

6. (i) Change the base of the following logarithmic expression from base *e* to base 10 and simplify as far as possible. [5]

$$\ln\left(\frac{100}{x^3}\right)$$

(ii) Expand and simplify the following logarithmic expression as far as possible. [5]

$$\log_7\left(\frac{\sqrt{x}}{47}\right)$$

7. What is the derivative of *y* for each of the following functions? [4×5]

(i) $y = 2x^3 + x^{-3} + 2$

(ii) $y = (1 - x^3)(x + 2)$

(iii) $y = e^{(3x^2+4x-1)}$

(iv) $y = x^2 \ln(x^2)$