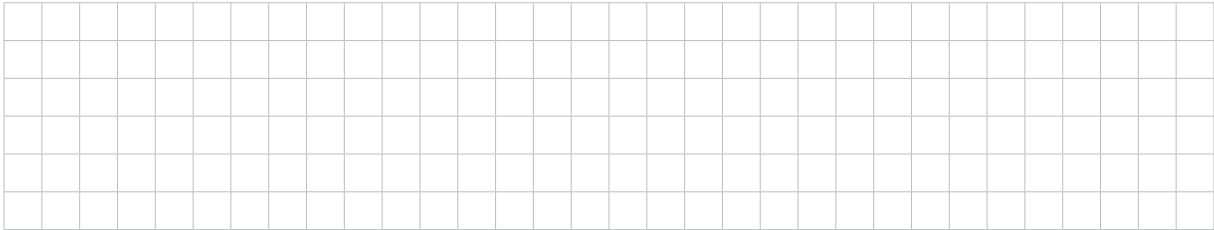


**Question 9** (15 marks)

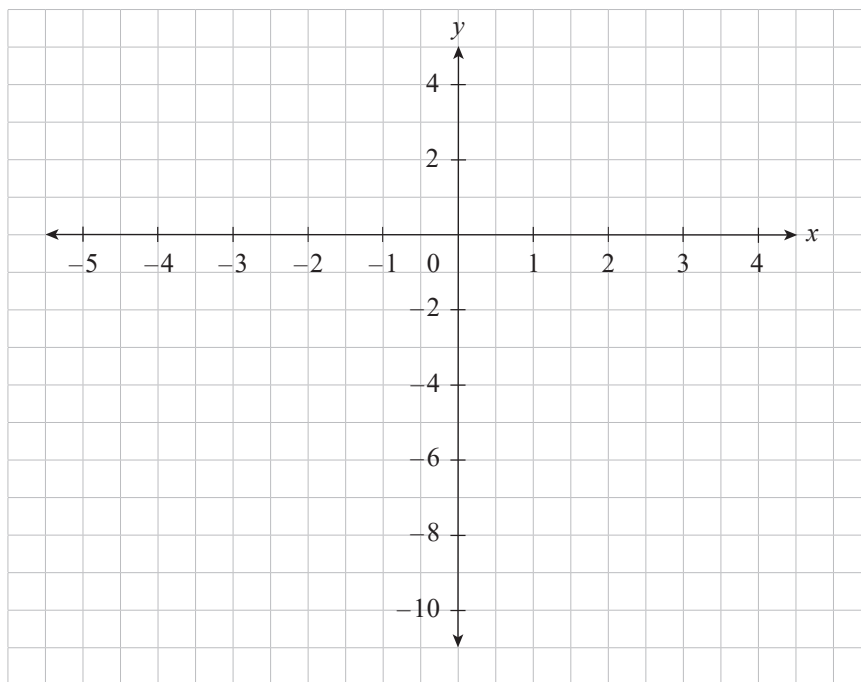
Consider  $f(x) = \frac{x^2 - 1}{x + 2}$ .

(a) Show that  $f(x) = x - 2 + \frac{3}{x + 2}$ .



(1 mark)

- (b) Sketch the graph of  $y = f(x)$  on Figure 7 below.  
Clearly label all asymptotes and the axes intercepts.

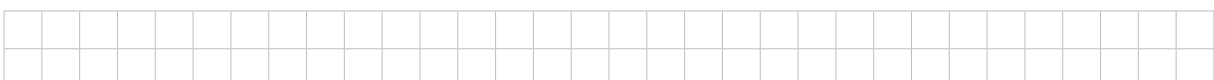


**Figure 7**

(4 marks)

- (c) (i) On Figure 7 above, sketch and clearly label the graph of  $y = f(|x|)$ . (2 marks)

- (ii) State the interval for which  $f(|x|) > f(x)$  for  $x > -2$ .

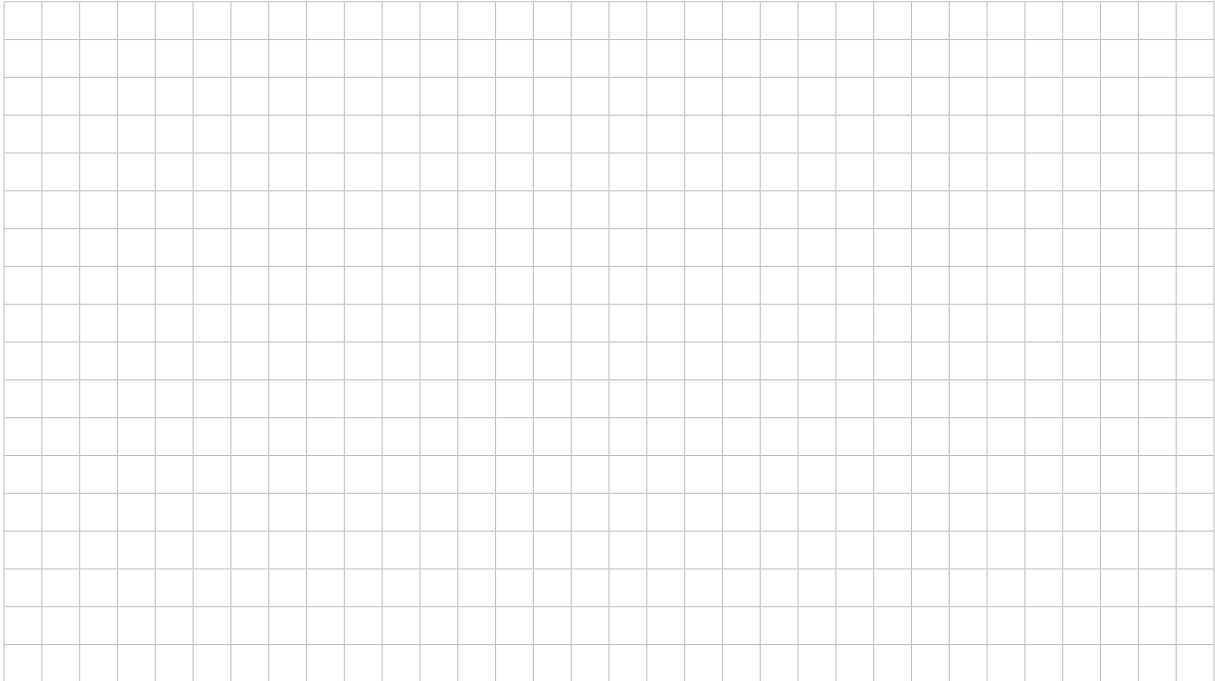


(1 mark)

(d) (i) Show that the expression for finding the area between  $f(|x|)$  and  $f(x)$  for  $x > -2$  is given by

$$\int_{-1}^0 -2x + \frac{6x}{4-x^2} dx.$$

Note that  $|x| = -x$  for  $x \leq 0$ .



(4 marks)

(ii) Hence show that the exact value of the area between  $f(|x|)$  and  $f(x)$  is

$$1 + 3 \ln \left( \frac{3}{4} \right).$$



(3 marks)