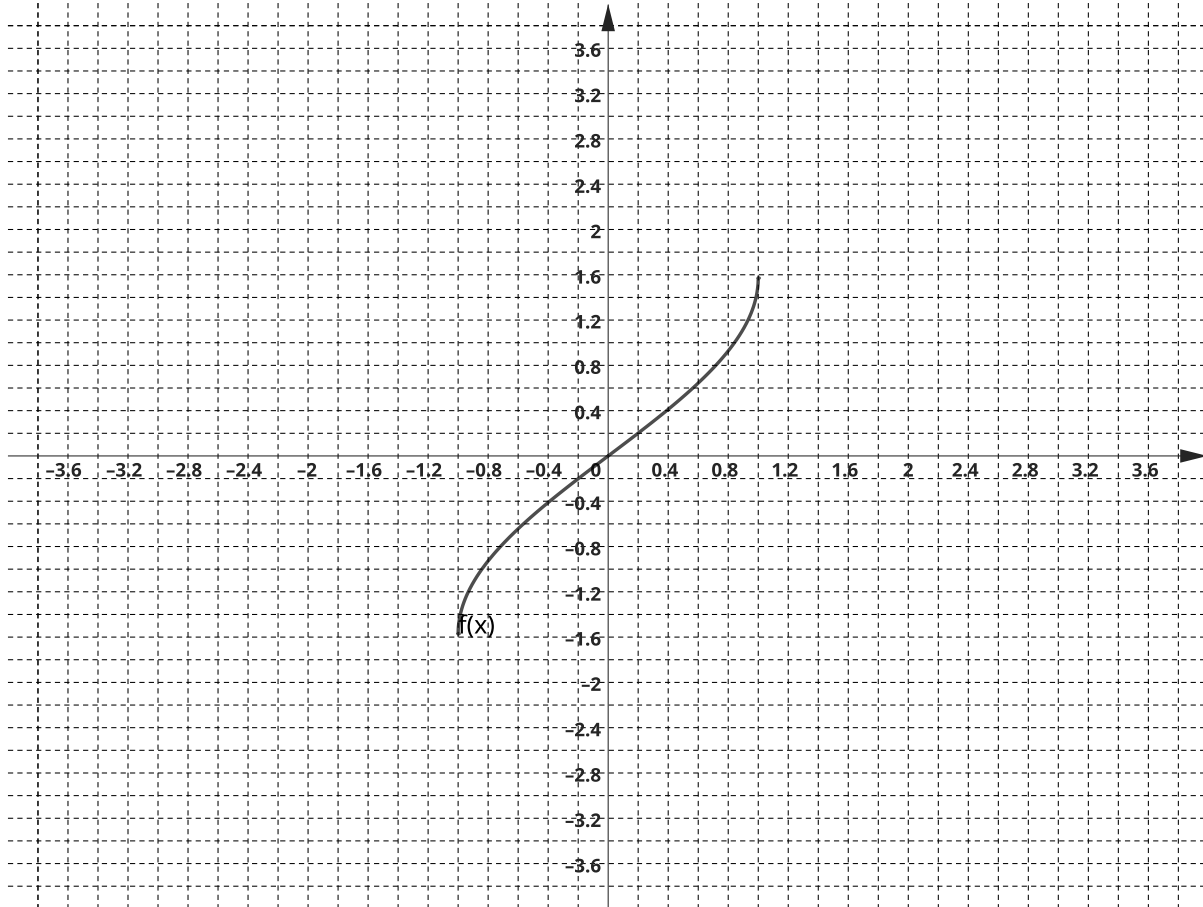


Books, watches, notes or cell phones are **not** allowed. The **only** calculators allowed are the Sharp EL-531\*\*\*. You **must** show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

**Question 1.** Given the graph of  $f(x) = \arcsin(x)$ .



- (2 marks) Find the endpoints of  $f(x)$ . *Important: No marks for approximations.*
- (1 mark) Find the domain.
- (1 mark) Find the range.
- (4 marks) On the same graph as the above sketch  $g(x) = -2f(x+2) - \frac{\pi}{2}$ . Label the endpoints of the graph  $g(x)$ .
- (1 mark) Find the limit

$$\lim_{x \rightarrow 0} f(x)$$

if it exists.

- (1 mark) Find the limit

$$\lim_{x \rightarrow 1^+} f(x)$$

if it exists.

**Question 3.** (3 marks) Find  $f$  and  $g$  where  $h(x) = (f \circ g)(x) = \sqrt{\frac{x^2-1}{x-3}}$  and state the domain of  $h$ .

**Question 3.** Given the function  $g(x)$  which has the real numbers as its domain and range. And satisfies all of the given conditions:

i.  $g(x) = x$  if  $x \in [-1, 1)$

iii.  $g(1) = 2$

v.  $\lim_{x \rightarrow -1} g(x) = -1$

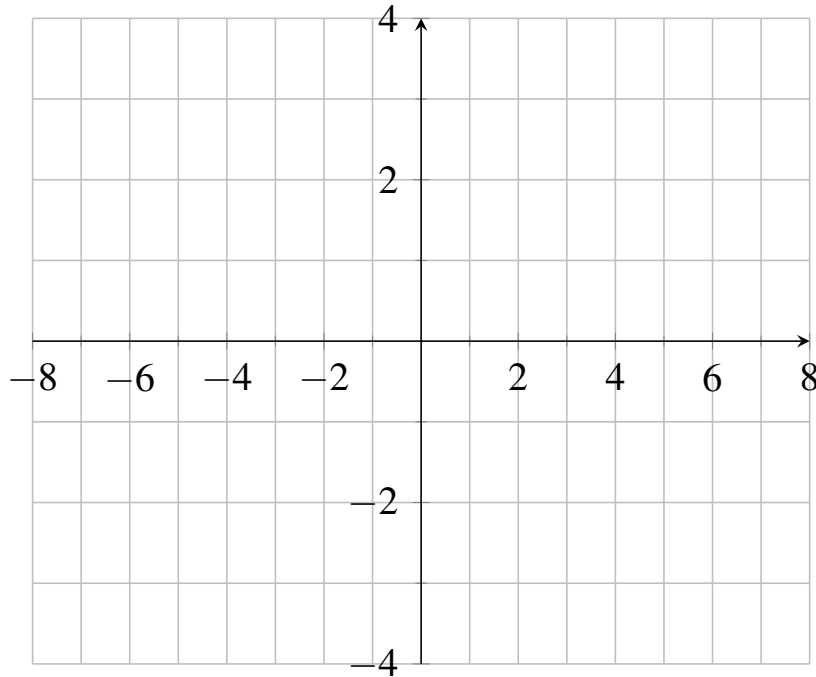
vii.  $\lim_{x \rightarrow \pi^-} g(x) = -2$

ii.  $g(x) = \cos x$  if  $x \in (\pi, 2\pi)$

iv.  $g(\pi) = \pi$

vi.  $\lim_{x \rightarrow 1} g(x)$  exists

a. (4 marks) Sketch  $g(x)$ , illustrate the behavior of the function on the entire domain, also appropriately label key points of the function.



b. (2 marks) Find all the value of  $a \in (-1, 2\pi)$  for which

$$\lim_{x \rightarrow a} g(x)$$

does not exist, justify.

**Question 4.** (4 marks) Evaluate the difference quotient  $\frac{f(a+h)-f(a)}{h}$  for  $f(x) = \frac{x+2}{x+1}$ . Simplify your answer.

**Question 5** (4 marks) Guess the value of the limit (if it exists)  $\lim_{h \rightarrow 0} \frac{(2+h)^2 - 32}{h}$  by evaluating the function at the numbers  $\pm 0.01, \pm 0.001, \pm 0.0001$  (give the result correct to six decimal places).

**Bonus.** (2 marks) Show that the composition of two odd functions is an odd function.