

CAML  
MCQ #6  
Friday, September the 19<sup>th</sup> 2025

1. What does the following function calculate?

```
let g x =  
  let f1 x = x * x in  
  let f2 x = f1 (f1 x) in  
  let f3 x = f2 (f2 x) in  
  f3 x * f1 x ;;
```

- (a)  $x^8$
- (b)  $x^{10}$
- (c)  $x^{12}$
- (d)  $x^{16}$
- (e)  $x^{18}$

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2. What is the evaluation result of the following phrase?

```
let f x =  
  if x < 0 then -x  
  else if x >= 0 then x ;;
```

- (a) `val f : int -> int = <fun>`
- (b) `val f : float -> float = <fun>`
- (c) `val f : int -> float = <fun>`
- (d) An error.

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3. What does the following function calculate when applied to three integer values?

```
let g x y z =  
  let h x y = if x > y then x else y  
  in  
    if h (h x y) z = z then  
      (x + y) * (x + y)  
    else  
      if x < y && y > z then  
        (z + x) * (x + z)  
      else  
        (y + z) * (y + z) ;;
```

- (a) The sum of the squares of the two largest.
- (b) The square of the sum of the two largest.
- (c) The square of the sum of the two smallest.
- (d) The sum of the squares of the two smallest.
- (e) Nothing, the function is wrong.

4. What does the evaluation result of the following phrase contain?

```
let g r =  
  match r with  
    "Admin" -> 3  
  | "User"   -> 2  
  | "Guest" -> 1  
  | ""      -> failwith ""  
in  
  g "Admin" ;;
```

- (a) `val g : string -> int -> int = <fun>`
- (b) `- : int = 3`
- (c) `Warning ...: this match case is unused.`
- (d) `Warning ...: this pattern-matching is not exhaustive.`
- (e) An error.

5. For which value(s) of a, the call to test a returns true ?

```
let test a =  
  let f n = if n < 0 then -1 else 1  
  in  
  match f a * a / 10 with  
    0 -> false  
  | 1 | 2 | 3 | 4 -> true  
  | n when n >= 10 -> false  
  | _ -> true ;;
```

- (a) `a = -12`
- (b) `a = -5`
- (c) `a = 0`
- (d) `a = 4`
- (e) `a = 10`

6. What is the evaluation result of the following phrase?

```
let a = let b = ('B', "one") in (0, b) ;;
```

- (a) `val a : int * char * string = (0, 'B', "one")`
- (b) `val a : (int * char) * string = ((0, 'B'), "one")`
- (c) `val a : int * (char * string) = ((0, 'B'), "one")`
- (d) `val a : int * (char * string) = (0, ('B', "one"))`
- (e) An error.

7. How many parameters does the below function f has?

```
let f = function  
  "1" -> (function (a, b) -> (a + b) / 2)  
  | "2" -> (function (a, b) -> if a < b then a else b)  
  | "3" -> (function (a, b) -> if a > b then a else b)  
  | _ -> failwith "" ;;
```

- (a) 0
- (b) 1
- (c) 2
- (d) 3
- (e) The function is wrong.

8. What does the following function displays called with f 5?

```
let rec f n = match n with
  0 -> ()
  | x when n mod 2 = 0 -> print_int n; f (n - 1)
  | n -> f (n - 1) ; print_int n ;;
```

- (a) 54321
- (b) 42135
- (c) 53124
- (d) 12345
- (e) Nothing, the function does not terminate!

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9. What will be the last result after successive evaluations of the following phrases?

```
let rec f n k =
  if k = 0 then
    1
  else
    if n mod k = 0 then
      1 + f (n - k) k
    else
      f n (k - 1) ;;

f 15 5 ;;
```

- (a) - : int = 0
- (b) - : int = 1
- (c) - : int = 3
- (d) - : int = 4
- (e) Nothing, the function does not terminate!

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10. How many calls to f will be processed with f 3 (f 3 included)?

```
let rec f n =
  if n <= 1 then
    n
  else
    2 * f (n - 1) + f (n - 1) ;;
```

- (a) 14
- (b) 7
- (c) 4
- (d) 3
- (e) An infinity.

# MCQ 6

Friday, 19 September

## Question 11

Select the correct answer(s)

- a. The definition domain of the function  $x \mapsto \ln(x)$  is  $]0, +\infty[$ .
- b. The definition domain of the function  $x \mapsto \ln(x)$  is  $\mathbb{R}$ .
- c.  $\ln(0) = 0$
- d.  $\ln(1) = 1$
- e. None of the others

## Question 12

Let  $x \in \mathbb{R}$ . Then :

- a.  $x = 0 \implies \sin(x) = 0$
- b.  $\sin(x) = 0 \implies x = 0$
- c.  $x < 1 \implies |x| < 1$
- d.  $|x| < 1 \implies x < 1$
- e. None of the others

## Question 13

Select the correct answer(s)

- a.  $\exists x \in \mathbb{R}, x^2 + 1 \neq 0$
- b.  $\exists x \in \mathbb{R}, e^x = -2$
- c.  $\forall x \in \mathbb{R}, \exists y \in \mathbb{R}, e^x = y$
- d.  $\exists y \in \mathbb{R}, \forall x \in \mathbb{R}, e^x = y$
- e. None of the others

### Question 14

Let  $E = \{1, 2, 3, 4\}$ . Select the expression(s) which is(are) both correctly written (good mathematical syntax) and true.

- a.  $(2, 4) \subset E$
- b.  $[2, 3] \subset E$
- c.  $\{1, 4\} \in E$
- d.  $1 \in E$
- e. None of the others

### Question 15

Let  $E = \{1, 2, 3\}$  and  $F = \{a, b, c, d\}$ . Then :

- a.  $(1, c) \in E \times F$
- b.  $\{1, c\} \subset E \times F$
- c.  $\{1\} \subset \mathcal{P}(E)$
- d.  $E \times F \in \mathcal{P}(E)$
- e. None of the others

### Question 16

Consider a given function  $f : \mathbb{R} \rightarrow \mathbb{R}$ . Suppose you have to prove that

$$\forall (x, y) \in \mathbb{R}^2, f(x) = f(y) \implies x = y$$

Which of these phrases can be the beginning of the proof?

- a. Assume that  $x = y$ .
- b. Assume that  $f(x) = f(y)$ . Let us show that  $x = y$ .
- c. Let  $(x, y) \in \mathbb{R}^2$  and assume that  $f(x) = f(y)$ . Let us show that  $x = y$ .
- d. None of the others

### Question 17

Select the expression(s) below which is(are) correctly expressed (good mathematical syntax) AND define(s) a function.

a.  $f : \begin{cases} \mathbb{R}^2 & \rightarrow \mathbb{R} \\ (x, y) & \mapsto x + 2y \end{cases}$

b.  $g : \begin{cases} \mathbb{R} & \rightarrow \mathbb{R} \\ 1 & \mapsto 2 \end{cases}$

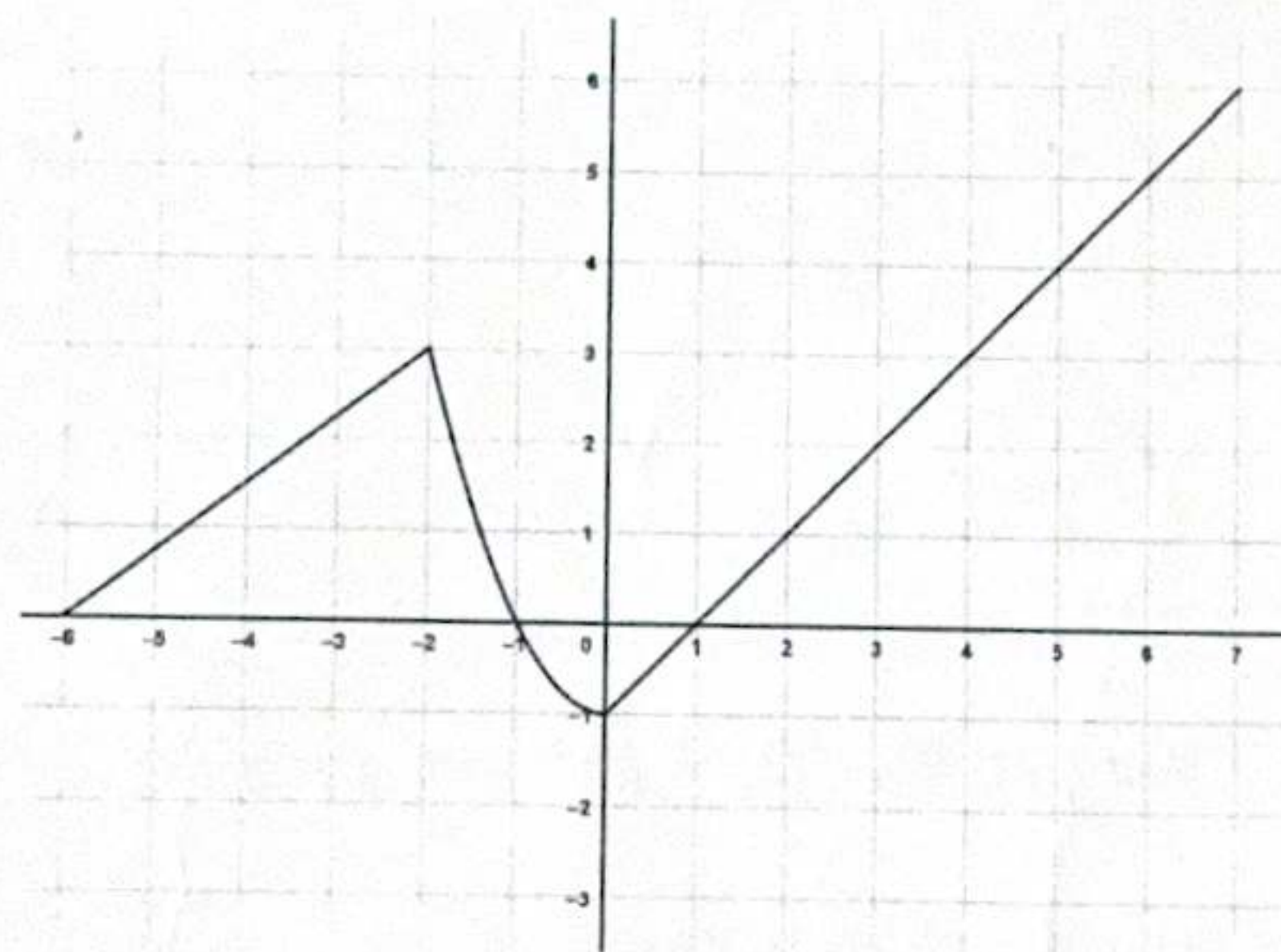
c.  $h : \begin{cases} \mathbb{R} & \rightarrow \mathbb{R} \\ (x, y) & \mapsto x + 2y \end{cases}$

d.  $i : \begin{cases} \mathbb{R}^2 & \rightarrow \mathbb{N} \\ (x, y) & \mapsto x + 2y \end{cases}$

e. None of these expressions

### Question 18

Consider the function  $f$  defined on  $[-6, 7]$  by the following graph :



Then :

a.  $f^{-1}(\{0\}) = \{-1\}$

b.  $f^{-1}(\{-1\}) = \{0\}$

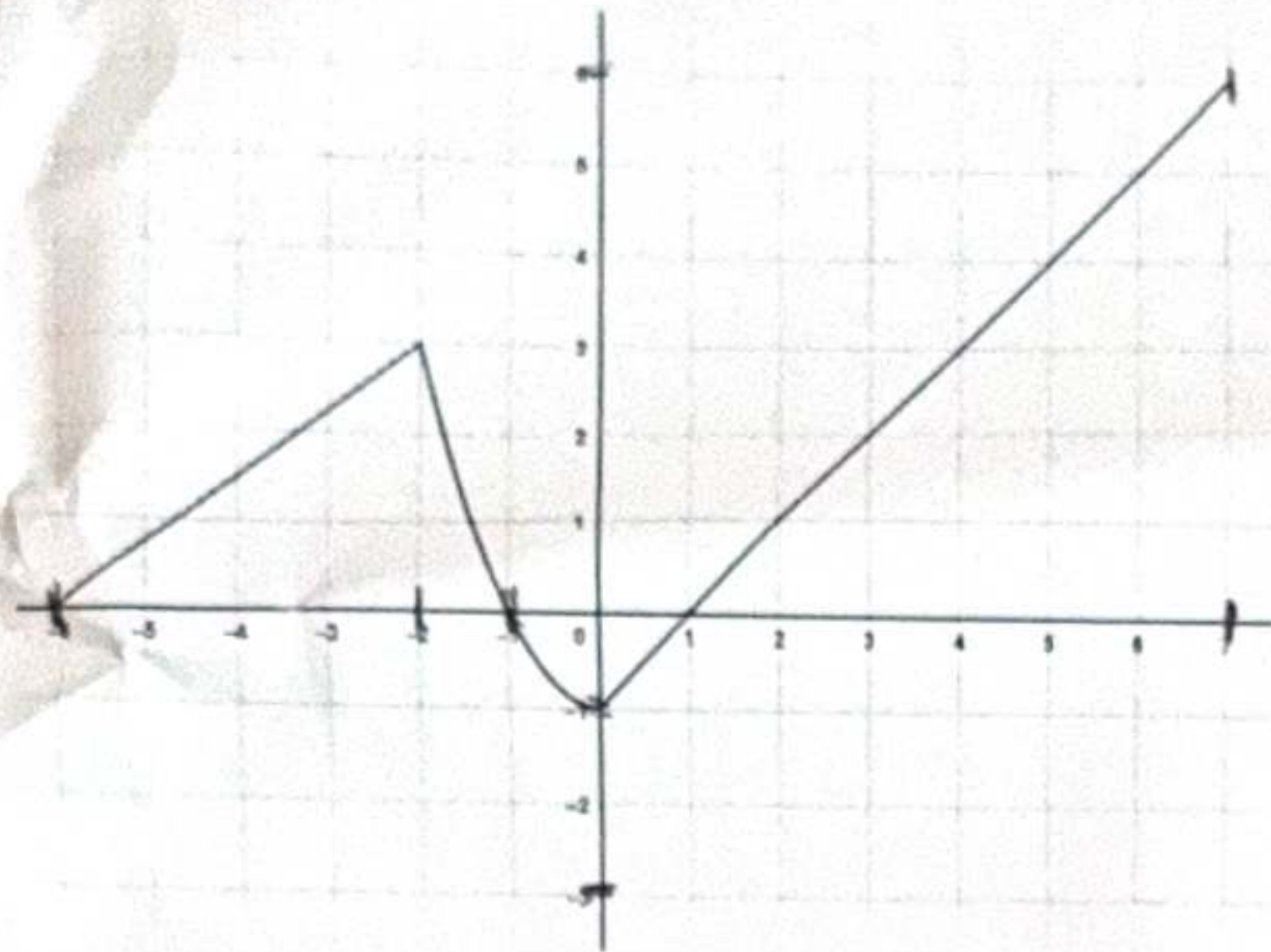
c.  $f^{-1}([-1, 3]) = [-6, 4]$

d.  $f^{-1}([-2, -1]) = \emptyset$

e. None of the others

### Question 19

Consider the function  $f : [-6, 7] \rightarrow [-3, 6]$  defined by the following graph :



- a.  $f$  is injective from  $[-6, 7]$  to  $[-3, 6]$ .
- b.  $f$  is injective from  $[-2, 7]$  to  $[-3, 6]$ .
- c.  $f$  is surjective from  $[-6, 7]$  to  $[-3, 6]$ .
- d.  $f$  is surjective from  $[-1, 7]$  to  $[-1, 6]$ .
- e. None of the others

### Question 20

Select the correct answer(s) :

- a. The definition domain of  $x \mapsto \arctan(x)$  is  $]0, +\infty[$
- b.  $\arctan(0) = 0$
- c.  $\arctan(1) = 0$
- d. To find  $\arctan(x)$ , you search the unique  $y \in ]0, 2\pi[$  such that  $x = \tan(y)$
- e. None of the others

ALGO		MATH PC		MATH PA	
1	E	11	A	11	B
2	D	12	A D	12	C
3	C	13	A C	13	B
4	BD	14	D	14	B C
5	AE	15	A	15	A
6	D	16	C	16	C
7	C	17	A	17	A
8	B	18	B C	18	B
9	E	19	D	19	A D
10	B	20	B	20	C