## AM 1 - Ficha 6 Resolução Teoremas da Continuidade e Função Inversa

Felipe Pinto - 61387 28/04 - 2021.1

### Conteúdo

Ι	Quest	tões	3
Qι	iestão 6	$f: \mathbb{R} \mapsto \mathbb{R}$	
	(	diferenciável em $x = 1$ ;	
		$f_{(1)} = 2 \mathbf{e} f'_{(1)} = 3$	3
	Q6 - d	$f'_{(e^{2x})};  x = 0  \dots  \dots  \dots  \dots  \dots$	3
	Q6 - e)	$f^{-1}_{(x)};  x=2  \dots  \dots  \dots  \dots  \dots$	3
Questão 7			
	Q7 - a)	$a_{(x)} = \ln(x) + \cos(2x) + e^{3x} + \arctan(5x) \dots \dots \dots$	3
	Q7 - b)	$b_{(x)} = (x^5 + x) \sin(x) \dots \dots$	3
	Q7 - c)	$c_{(x)} = \ln(\cos(x)) \cdot \dots \cdot$	3
	Q7 - d)	$d_{(x)} = e^{-x}/(x^2+1) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$	3
	Q7 - e)	$e_{(x)} = \tan(x) + \cot(x)$	3
	Q7 - f)	$f_{(x)} = (x^2 + 1) \arctan(x) \dots \dots \dots \dots \dots \dots \dots \dots$	3
	Q7 - h)	$h_{(x)} = e^{\ln^2(x)} \dots \dots$	4
	Q7 - i)	$i_{(x)} = \cos(\arcsin(x))$	4

	Q7 - j) $j_{(x)} = \sinh(x)/\cosh(x)$	4
	(i) Nota:	
	Q7 - k) $k_{(x)} = \arctan(\ln(1+x^2))$	4
	Q7 - 1) $l_{(x)} = x/(1 + e^{1/x}) \dots$	4
	Q7 - m) $m_{(x)} = \ln(\ln(x))$	5
Π	Questões	5
E1	$f_{(x)} = e^{3x}/(e^x - 2)$	5

### Parte I

# Questões

Questão 6 
$$f: \mathbb{R} \mapsto \mathbb{R}$$
  
diferenciável em  $x = 1$ ;  
 $f_{(1)} = 2$  e  $f'_{(1)} = 3$ 

**Q6 - d)** 
$$f'_{(e^{2x})}; \quad x = 0$$

**Q6 - e)** 
$$f^{-1}(x)$$
;  $x = 2$ 

### Questão 7

**Q7 - a)** 
$$a_{(x)} = \ln(x) + \cos(2x) + e^{3x} + \arctan(5x)$$

$$a'_{(x)} = \frac{1}{x} - 2\sin(2x) + 3xe^{3x} + \frac{5}{1 + 25x^2}$$

**Q7 - b)** 
$$b_{(x)} = (x^5 + x) \sin(x)$$

$$b'_{(x)} = (5x^4 + x)\sin(x) + (x^5 + x)\cos(x)$$

**Q7 - c)** 
$$c_{(x)} = \ln(\cos(x))$$

$$c'_{(x)} = \cdots$$

**Q7 - d)** 
$$d_{(x)} = e^{-x}/(x^2+1)$$

$$d'_{(x)} = \frac{-e^{-x}(x^2+1) - e^{-x}(2x)}{(x^2+1)^2}$$

**Q7 - e)** 
$$e_{(x)} = \tan(x) + \cot(x)$$

$$e'_{(x)} = \frac{1}{\cos^2(x)} - \frac{1}{\sin^2(x)}$$

**Q7 - f)** 
$$f_{(x)} = (x^2 + 1) \arctan(x)$$

$$f'_{(x)} = (2x) \arctan(x) + (x^2 + 1) \frac{1}{1 + x^2} = 2x \arctan(x) + 1$$

**Q7 - h)** 
$$h_{(x)} = e^{\ln^2(x)}$$

$$h'_{(x)} = 2 \ln(x) \frac{1}{x} e^{\ln^2(x)}$$

Q7 - i) 
$$i_{(x)} = \cos(\arcsin(x))$$

$$i'_{(x)} = -\sin(\arcsin(x)) \frac{1}{\sqrt{1-x^2}} = \frac{-x}{\sqrt{1-x^2}}$$

**Q7 - j)** 
$$j_{(x)} = \sinh(x)/\cosh(x)$$

$$j'_{(x)} = \frac{\cosh^2(x) - \sinh^2(x)}{\cosh^2(x)} = \cosh^{-2}(x)$$

#### (i) Nota:

$$\sinh(x) = \frac{e^x - e^{-x}}{2} \qquad (\sinh(x))' = x' \cosh(x)$$

$$\cosh(x) = \frac{e^x + e^{-x}}{2} \qquad (\cosh(x))' = x' \sinh(x)$$

**Q7 - k)** 
$$k_{(x)} = \arctan(\ln(1+x^2))$$

$$k'_{(x)} = \frac{(2x)/(1+x^2)}{1+\ln^2(1+x^2)}$$

**Q7 - 1)** 
$$l_{(x)} = x/(1 + e^{1/x})$$

$$l'_{(x)} = \frac{1 + e^{1/x} + x e^{1/x}/x^2}{(1 + e^{1/x})^2} = \frac{1 + e^{1/x} + e^{1/x}/x}{(1 + e^{1/x})^2}$$

**Q7 - m)** 
$$m_{(x)} = \ln(\ln(x))$$

$$m'_{(x)} = \frac{1}{\ln(x)} \, \frac{1}{x}$$

## Parte II

# Questões

**E1** 
$$f_{(x)} = e^{3x}/(e^x - 2)$$

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