

2. CALCULUS AREA**1. Limits and Derivatives**

(1991-CE-A MATH 1 #02) (5 marks)

2. Let $f(x) = \frac{1}{1+x}$. Find $f'(x)$ from the first principles.

(1993-CE-A MATH 1 #01) (5 marks)

1. (a) Simplify $(\sqrt{2(x+\Delta x)} - \sqrt{2x})(\sqrt{2(x+\Delta x)} + \sqrt{2x})$.

- (b) Find $\frac{d}{dx}(\sqrt{2x})$ from the first principles.

(1996-CE-A MATH 1 #02) (4 marks)

2. Find $\frac{d}{dx}(x^2)$ from first principles.

(1998-CE-A MATH 1 #01) (4 marks)

1. Find $\frac{d}{dx}(\sqrt{x})$ from first principles.

(2000-CE-A MATH 1 #03) (5 marks)

3. (a) Show that $\frac{1}{\sqrt{x+\Delta x}} - \frac{1}{\sqrt{x}} = \frac{-\Delta x}{\sqrt{x}(\sqrt{x+\Delta x})(\sqrt{x} + \sqrt{x+\Delta x})}$.

- (b) Find $\frac{d}{dx}\left(\frac{1}{\sqrt{x}}\right)$ from first principles.

(2003-CE-A MATH #02) (4 marks)

2. Find $\frac{d}{dx}(x^3)$ from first principles.

(2005-CE-A MATH #03) (4 marks)

3. Find $\frac{d}{dx}\left(\frac{1}{x}\right)$ from first principles.

(2007-CE-A MATH #04) (4 marks)

4. Find $\frac{d}{dx}(x^2 + 1)$ from first principles.

(2009-CE-A MATH #08) (4 marks)

8. Find $\frac{d}{dx}(\sqrt{x+1})$ from first principles.

Past Papers Questions

(SP-DSE-MATH-EP(M2) #01) (4 marks)

1. Find $\frac{d}{dx}(\sqrt{2x})$ from first principles.

(PP-DSE-MATH-EP(M2) #06) (4 marks)

6. Find $\frac{d}{dx}\left(\frac{1}{x}\right)$ from first principles.

(2012-DSE-MATH-EP(M2) #01) (3 marks)

1. Let $f(x) = e^{2x}$. Find $f'(0)$ from first principles.

(2013-DSE-MATH-EP(M2) #01) (4 marks)

1. Find $\frac{d}{dx}(\sin 2x)$ from first principles.

(2015-DSE-MATH-EP(M2) #01) (4 marks)

1. Find $\frac{d}{dx}(x^5 + 4)$ from first principles.

(2016-DSE-MATH-EP(M2) #02) (5 marks)

2. Prove that $\frac{1}{\sqrt{x}} - \frac{1}{\sqrt{x+h}} = \frac{h}{(x+h)\sqrt{x} + x\sqrt{x+h}}$. Hence, find $\frac{d}{dx}\sqrt{\frac{3}{x}}$ from first principles.

(2017-DSE-MATH-EP(M2) #01) (5 marks)

1. Find $\frac{d}{d\theta} \sec 6\theta$ from first principles.

(2018-DSE-MATH-EP(M2) #01) (4 marks)

1. Let $f(x) = (x^2 - 1)e^x$. Express $f(1+h)$ in terms of h . Hence, find $f'(1)$ from first principles.

(2019-DSE-MATH-EP(M2) #01) (4 marks)

1. Let $f(x) = \frac{10x}{7+3x^2}$. Prove that $f(1+h) - f(1) = \frac{4h - 3h^2}{10 + 6h + 3h^2}$. Hence, find $f'(1)$ from first principles.

(2020-DSE-MATH-EP(M2) #02) (4 marks)

2. Define $f(x) = \frac{x}{\sqrt{2+x}}$ for all $x > -2$. Find $f'(2)$ from first principles.

(2021-DSE-MATH-EP(M2) #01) (4 marks)

1. Let $f(x) = \frac{1}{3x^2 + 4}$. Find $f'(x)$ from first principles.

ANSWERS

(1991-CE-A MATH 1 #02)

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

(1993-CE-A MATH 1 #01)

1. (a) $2\Delta x$
(b) $\frac{1}{\sqrt{2x}}$

(1996-CE-A MATH 1 #02)

2. $2x$

(1998-CE-A MATH 1 #01)

1. $\frac{1}{2\sqrt{x}}$

(2000-CE-A MATH 1 #03)

3. (b) $-\frac{1}{2}x^{-\frac{3}{2}}$

(2003-CE-A MATH #02)

2. $3x^2$

(2005-CE-A MATH #03)

3. $\frac{-1}{x^2}$

(2007-CE-A MATH #04)

4. $2x$

(2009-CE-A MATH #08)

8. $\frac{1}{2\sqrt{x+1}}$

(SP-DSE-MATH-EP(M2) #01)

1. $\frac{1}{\sqrt{2x}}$

(PP-DSE-MATH-EP(M2) #06)

6. $\frac{-1}{x^2}$

(2012-DSE-MATH-EP(M2) #01)

1. 2

(2013-DSE-MATH-EP(M2) #01)

1. $2 \cos 2x$

(2015-DSE-MATH-EP(M2) #01)

1. $5x^4$

(2016-DSE-MATH-EP(M2) #02)

2. $\frac{-\sqrt{3}}{2}x^{-\frac{3}{2}}$

(2017-DSE-MATH-EP(M2) #01)

1. $6 \sec 6\theta \tan 6\theta$

(2018-DSE-MATH-EP(M2) #01)

1. $f(1+h) = h(h+2)e^{1+h}$
 $f'(1) = 2e$

(2019-DSE-MATH-EP(M2) #01)

1. $\frac{2}{5}$

(2020-DSE-MATH-EP(M2) #02)

2. $\frac{3}{8}$

(2020-DSE-MATH-EP(M2) #02)

1. $\frac{-6x}{(3x^2+4)^2}$