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February 26

In-class activity : Chain rule

1. Compute the derivative of the following functions :

i) $f(x) = \cos(2x)$

ii) $f(x) = \sin(x^2)$

iii) $f(x) = \cos(e^x)$

iv) $f(x) = \tan^7(x)$

v) $f(x) = \frac{1}{2x+3}$

vi) $f(x) = \sqrt{x^2 + 3x}$

vii) $f(x) = \sin(\sqrt{x})$

viii) $f(x) = \frac{\sin(x)}{\cos(2x)+3}$

ix) $f(x) = \sqrt{3 + \sqrt{x+1}}$

x) $f(x) = e^{\cos(x)}$

xi) $f(x) = \cos(2x)\sin(3x)$

xii) $f(x) = x^2 e^{3x}\cos(x)$

xiii) $f(x) = \tan(7x^2 + 3x + 1)$

xiv) $f(x) = \frac{1}{2x^4+3}$

xv) $f(x) = x\sqrt[4]{x}^3$

xvi) $f(x) = \sqrt{5 - x^7}$

xvii) $f(x) = \sqrt{\sin(x)}$

xviii) $f(x) = \tan(\sin(e^x))$

xix) $f(x) = \frac{e^{2x}}{\sqrt{x^2-1}}$

2. Let $f(x)$ and $g(x)$ be differentiable functions such that $g(1) = 2$, $f(2) = 1$, $f'(2) = 3$ and $g'(1) = 2$.

(a) Compute $h'(1)$ where $h(x) = xf(g(x)) + 4\frac{f(x)}{f(g(x))}$.

(b) Compute $h'(1)$ where $h(x) = g(x)^2 f(g(x))$.

3. A herring swimming along a straight line has travelled $s(t) = \frac{t^2}{t^2+2}$ feet in 2 in t seconds.

i) Determine the average velocity in the interval $[0, 1]$.

ii) Find the instantaneous velocity at $t = 3$.

iii) Determine whether the herring is speeding up or slowing down at time $t = 3$.

4. The population in millions of artic flounders in the Atlantic Ocean is modelled by the function $P(t) = \frac{8t+3}{0.2t^2+1}$, where t is measured in years.

i) Determine the initial flounders population.

ii) Has the population increased or decreased after 10 years ?

iii) Is the flounders population increasing or decreasing during the tenth year ?