M124
Fall 2023

Quiz 4

Name:_____

No calculators or notes allowed.

1. Write the definition of $f'(x)$ below:

2. Values of the functions f, g, f' and g' are given in the table below:

x	-1	0	1	2
f	11	7	2	5
f'	1	3	4	3
g	-3	2	-1	1
g'	2	1	5	2

   (a) If $H(x) = f(g(x))$, find $H'(1)$.

   (b) If $H(x) = f(x)/g(x)$, find $H'(0)$.

   (c) If $H(x) = f(x)g(x)$, find $H'(2)$.

   (d) If $H(x) = f(f(x))$, find $H'(1)$.

3. Differentiate each expression. You do NOT need to simplify.

(a) $y = \tan(x) + 3x^5 - \sqrt{x} + \dfrac{2}{x^4}$.

(b) $p(t) = 3^t - \pi \mathrm{e}^t + \mathrm{e}^4$

(c) $g(\theta) = \sin(\mathrm{e}^\theta) + \mathrm{e}^{\sin(\theta)}$

(d) $z(t) = \sin(t^2)\cos(t^3)$

(e) $p(y) = \dfrac{y\sin(y)}{y^2\cos(y) + 1}$

(f) $f(x) = \sqrt{x}(x^3 + 9)$

(g) $P(z) = z^4 + 4^z + 4\cos(z) - \sin\left(\frac{\pi}{2}\right)$

Question continued on next page...

(h) $h(t) = \dfrac{\cos(3t)}{\mathrm{e}^{2t}+1}$

(i) $G(x) = \cos(2^{x^2})$

(j) $f(x) = \sec(\sqrt{3x+2})$

4. Find the equation of the tangent line to $y = \sqrt{\mathrm{e}^x + 3}$ at $x = 0$.

5. Find the expression for $f'(x)$ and $f''(x)$ for each function below:

   (a) $f(x) = x^3\mathrm{e}^x$.

   (b) $f(x) = \mathrm{e}^x \sin(x)$.

6. Suppose that $f(x)$ is a differentiable function. Find an expression for $h'(x)$, if

$$h(x) = (f(x))^2 + \mathrm{e}^{f(x)} + x^2 f(x)$$