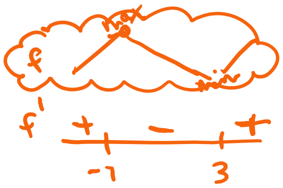
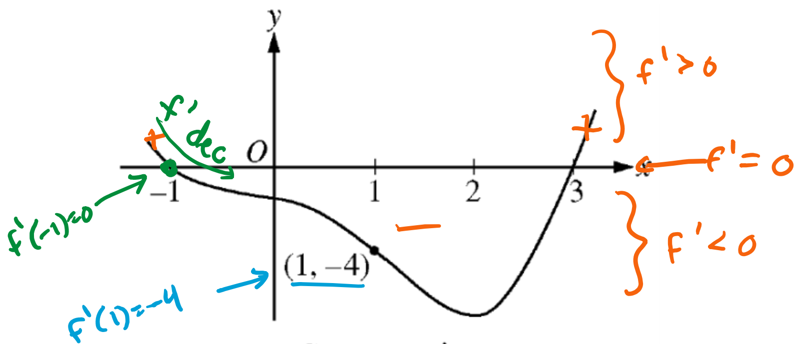
FRQ **Date:**___________





Graph of f'

Let f be a twice-differentiable function defined on the interval $-1.2 < x < 3.2$ with $\boxed{f(1) = 2}$. The graph of f', the derivative of f, is shown above. The graph of f' crosses the x-axis at $x = -1$ and $x = 3$ and has a horizontal tangent at $x = 2$. Let g be the function given by $g(x) = e^{f(x)}$.

(a) Write an equation for the line tangent to the graph of g at $x = 1$.

(b) For $-1.2 < x < 3.2$, find all values of x at which g has a local maximum. Justify your answer.

(c) The second derivative of g is $g''(x) = e^{f(x)}\left[\left(f'(x)\right)^2 + f''(x)\right]$. Is $g''(-1)$ positive, negative or zero? Justify your answer.

(d) Find the average rate of change of g', the derivative of g, over the interval [1,3].

a) $y - y_1 = m(x - x_1)$

$y - g(1) = g'(1)(x-1)$

$\boxed{y - e^2 = -4e^2(x-1)}$

$g(1) = e^{f(1)}$
$= e^2$

$g'(x) = f'(x) \cdot e^{f(x)}$
$g'(1) = f'(1)e^{f(1)}$
$= -4e^2$

b) g has a local max @ $x = -1$ b/c f' changes from pos to neg @ $x = -1$

c) $g''(-1) = e^{f(-1)}\left[\left(f'(-1)\right)^2 + f''(-1)\right]$
$= e^{f(-1)}\left(0^2 + f''(-1)\right)$
$= + (-)$ ... ☹

$e^{f(-1)} > 0$ b/c $e^x > 0 \ \forall x$.
$f''(-1) < 0$ b/c f' dec @ $x = -1$.

$\boxed{\therefore g''(-1) < 0}$

$g'(3) = f'(3)e^{f(3)}$
$= 0e^{f(3)}$
$= 0$

d) avg rate of change of g' $= \dfrac{g'(3) - g'(1)}{3-1} = \dfrac{0 - (-4e^2)}{2} = \dfrac{4e^2}{2}$
$= \boxed{\dfrac{2e^2}{2}}$