Name: Ley

Directions

- This counts as your "attendance" for the day. You must give this to me today to get credit for it.
- You may leave if you finish the packet.
- You may work in groups, and you can ask me for assistance.
- I grade this worksheet based on completion, not accuracy; however, you should strive for completely correct answers in order to make sure you understand the material.
- 1. Find the derivatives of the functions shown below.

(a)
$$f(x) = 186.5$$

$$f'(x) = 0$$
(Derivative of constants is gluens of (b) $g(t) = 2 - \frac{2}{3}t$

(c)
$$r(x) = \frac{1}{x} + \sin(x)$$

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(d)
$$\ell(s) = 2s^3 + (s^4)$$

$$\begin{cases} 1 \\ 1 \\ 1 \end{cases} = 2 \\ 1 \\ 2s^3 + (s^4) \end{cases}$$

$$= 2 \\ 1 \\ 2s^3 + (s^4)$$

$$= 2 \\ 2s^3 + (s$$

(e)
$$f(x) = e^x + x$$

$$f'(x) = e^x + 1$$

$$t^{1/4} \qquad (\cos(t))' = -\sin/t$$
(f) $g(t) = (\sqrt[4]{t}) + 13e^{t} - \cos(t)$

$$g'(t) = \frac{1}{4} t (\sqrt[4]{t}) - 13e^{t} + \sin/t$$

$$g'(t) = \frac{1}{4} t^{-3/4} - 13e^{t} + \sin/t$$

(g)
$$h(t) = -16t^2 + 20t + 100$$

 $h'(t) = -32t + 20$

(h)
$$f(t) = \frac{1}{2}t^6 - 3t^4 + t$$

 $f'(t) = 3t^5 - 12t^3 + 1$

2. Find the equation of the tangent line to \sqrt{x} at x=9.

$$f'(q) = \frac{1}{2} \frac{1}{\sqrt{q}} = \left(\frac{1}{6}\right)$$

$$\left(x = \frac{1}{x^{1/2}} = \frac{1}{\sqrt{x}}\right)$$

$$m = \frac{1}{6}$$
.

$$3 = \frac{1}{6} \cdot 9 + b$$

$$m = \frac{1}{6}.$$

$$3 = \frac{1}{6} \cdot 9 + b$$

$$1 = \frac{1}{6} \times + 1.5$$

$$3 = \frac{3}{2} + b$$

3. Find the slope of the tangent line to $f(x) = \frac{1}{\sqrt{x}}$ at x = 2. Make a sketch of f(x) and its tangent line.

$$f'(z) = -\frac{1}{2}(z)^{-3/2}$$

$$= -\frac{1}{2}(1+1)$$

$$f(x) = x^{-1/2}$$

$$f'(x) = (-\frac{1}{2}) \times (-\frac{1}{2} - 1)$$

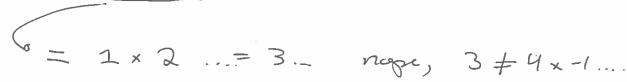
$$= -\frac{1}{2} \times 3/2$$

4. Derivatives don't always work the way you want, especially with products and quotients. Consider
$$f(x) = (x-2)(2x+3)$$
.

(a) Find f'(x) by first distributing.

$$f(x) = 2x^2 + 3x - 4x - 6$$

(b) Is this the same as doing $(x-2)' \times (2x+3)'$?



(c) Based on this, what do you think of the validity of the "formula" $\frac{d}{dx}(f(x)g(x)) = f'(x)g'(x)$?

5. The derivative of a function is also a function, so there's no reason why we couldn't take the derivative again. We call this (very creatively) the second derivative. That is, given f(x), we calculate (f')', the derivative of the derivative. We usually write f''(x) for this instead. Calculate f''(x) for the following functions.

(a)
$$f(x) = x^2$$
.

$$f'(x) = 2x$$

$$\int f''(x) = 2$$

(b)
$$f(x) = \frac{1}{x} = x^{-1}$$

$$f'(x) = (-1)x^{-2}$$

$$f''(x) = (-1)(-2)x^{-3}$$

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

6. Optimize (find max's and min's) of the functions below on the given intervals using the method outlined in class.

(a)
$$f(x) = -4x^2 - 2x + 3$$
, on $[-2, 0]$.

$$x = -\frac{2}{8}$$

$$x = -\frac{1}{4}$$

$$x =$$

$$f(-\frac{1}{4}) = \frac{13}{4} = 3.25$$

$$M: \mathbb{Q} \times = -2$$
, of $y = -9$

(b)
$$g(x) = e^x - 2x$$
 on $[-1, 1]$

(a)
$$f(x) = -4x - 2x + 3$$
, on $[-2,0]$.

(b) $g(x) = e^x - 2x$ on $[-1,1]$

(c) $f'(x) = -8x - 2 = 0$

$$-8x = 2$$

$$x = -\frac{2}{8}$$

$$x = -\frac{2}{8}$$

$$x = -\frac{2}{8}$$

$$x = -\frac{2}{8}$$

$$g(-1) = e^{-1} - 2(-1) = 2.37$$