Name: _____

Test 2

MATH 200, Section 9

April 2, 2021

Directions: Closed book, closed notes, no calculators. Put all phones, etc., away. You will need only a pencil or pen.

1. (36 points) Find the derivatives of these functions. You do **not** need to simplify your answers.

   (a) $\dfrac{d}{dx}\Big[e^x \ln(x)\Big] =$

   (b) $\dfrac{d}{dx}\Big[\sin^{-1}(x)\Big] =$

   (c) $\dfrac{d}{dx}\left[\Big(2+\ln(x+e^x)\Big)^4\right] =$

   (d) $\dfrac{d}{dx}\left[\dfrac{\ln(x)}{x}\right] =$

   (e) $\dfrac{d}{dx}\left[\dfrac{1}{\sqrt{\ln(x)}}\right] =$

   (f) $\dfrac{d}{dx}\Big[\tan^{-1}\left(x^3+3x\right)\Big] =$

2. (4 points) Find: $\lim\limits_{h\to 0}\dfrac{\ln(4+h)-\ln(4)}{h} =$

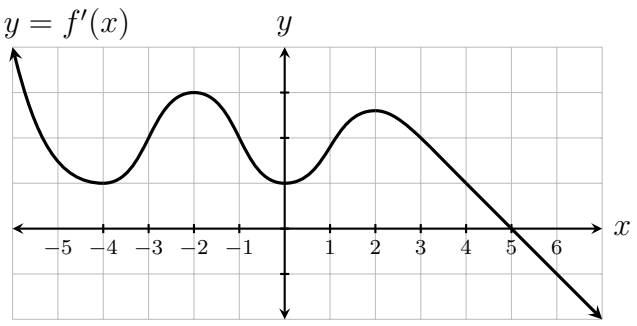
3. (12 points) Given the equation $\ln|x+y| = xy+1$, find y'.

4. (12 points) A spherical balloon is deflating in such a way that its volume is decreasing at a rate of 18 cubic feet per hour. At what rate is the radius changing when the radius is 3 feet?

5. (12 points) A rocket has a height of $t+t^2$ meters t seconds after it is launched. How high is the rocket when its velocity is 101 meters per second?

6. (12 points) Find the locations (x-coordinates) of any local extrema of $f(x) = x^2e^x$.

7. (12 points) The graph of the **derivative** $f'(x)$ of a function f is shown below.



(a) State the critical points of f.

(b) State the interval(s) on which f increases.

(c) State the interval(s) on which f decreases.