

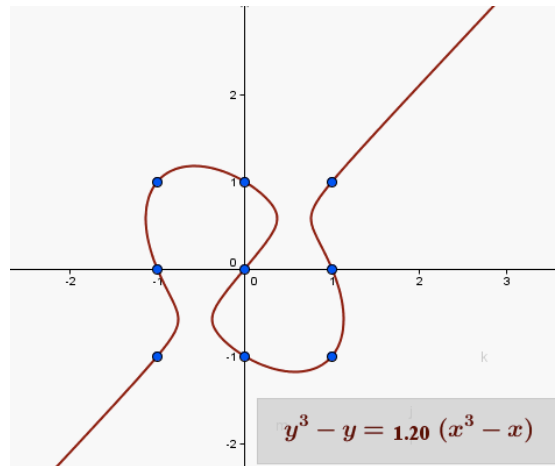
Name: _____

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Math 120 Calculus I
Second Test
October 2013

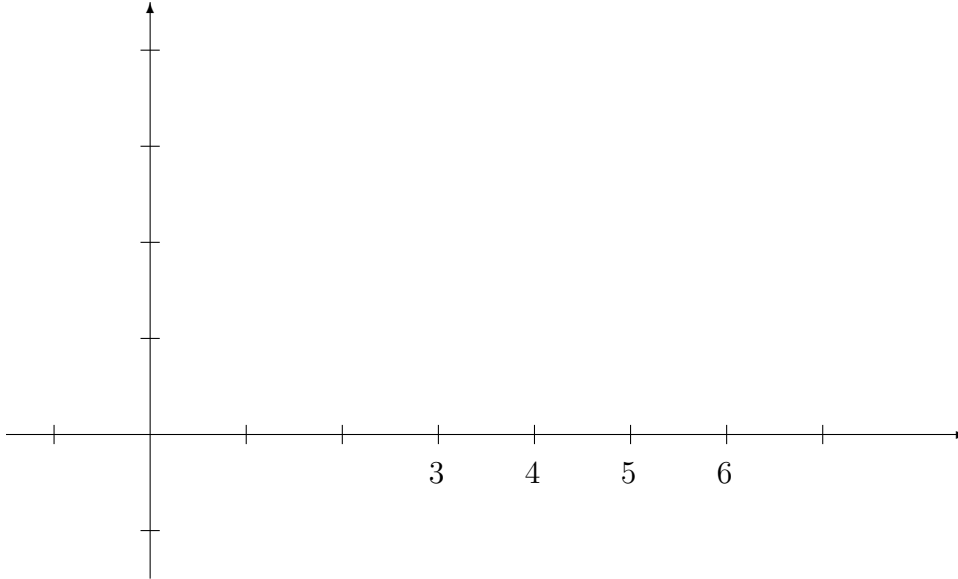
You may use a calculator. Leave your answers as expressions such as $e^2 \sqrt{\frac{\sin^2(\pi/6)}{1 + \ln 10}}$ if you like. Show all your work for credit. Points for each problem are in square brackets.

- [15] On implicit differentiation. The point $(1, 0)$ lies in the curve $y^3 - y = 1.2(x^3 - x)$. Determine the slope of the line tangent to the curve at that point.

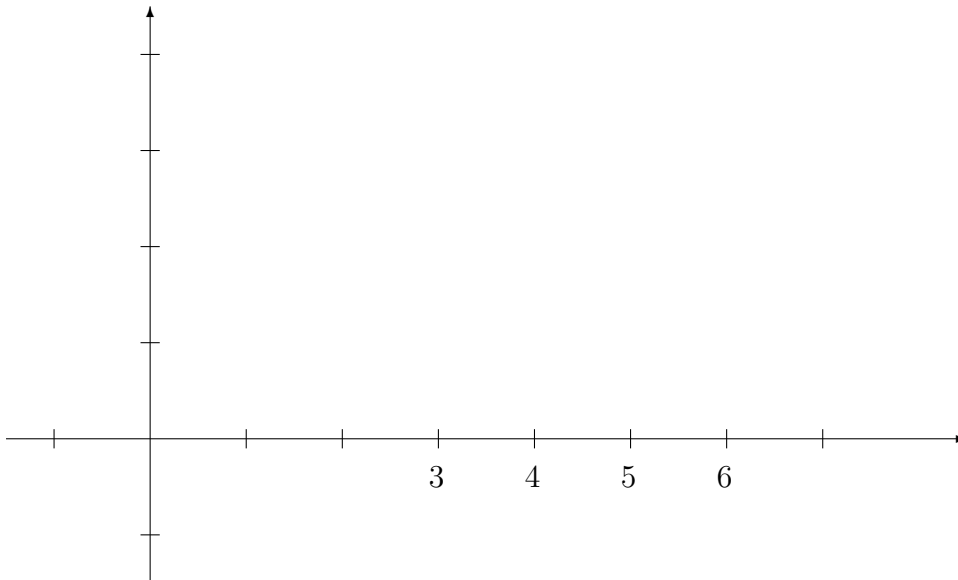


2. [10] Graphs and derivatives.

a. [5] Sketch the graph $y = f(x)$ of a function for which is continuous everywhere and differentiable everywhere except at $x = 4$.



b. [5] Sketch the graph $y = f(x)$ of a function that is differentiable everywhere and whose derivative is 0 at $x = 3$ and $x = 5$ but nonzero everywhere else.



- 3.** [15] Recall the definition of derivatives in terms of limits, $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$. Use that definition to show that the derivative of $f(x) = 5 + \frac{1}{x}$ is $f'(x) = -\frac{1}{x^2}$. (Do not use any of the rules of differentiation, just the definition.)

4. [15] On logarithmic differentiation. The function $y = f(x) = (x^2 + 4)^x$ cannot be differentiated by the power rule since the exponent is not constant, and it can't be differentiated by the exponential rule since the base is not constant, but you can find its derivative with logarithmic differentiation. Find its derivative. Show your work, and write carefully. Express your answer $f'(x)$ in terms of x .

5. [45; 9 points each part] Differentiate the following functions. Do not simplify your answers. Use parentheses properly.

a. $f(t) = 7t^4 - 4\sqrt{t} + 6 + \frac{25}{t^2}$

b. $g(x) = \sin 5x + \tan 3x$

c. $y = \frac{e^x + \ln x}{5 + \sqrt{x}}$

d. $f(x) = x \arctan x$. (Note that the inverse tangent function $\arctan x$ is often written $\tan^{-1} x$, but it does not equal $(\tan x)^{-1}$.)

e. $f(\theta) = \theta^3 \cos \sqrt{\theta}$

#1.[15]	
#2.[10]	
#3.[15]	
#4.[15]	
#5.[45]	
Total	