

Name: .....

MATH-165 Puzzle Collection 2

23 12:10pm-Wumaier 24 12:10pm-Njus

2016 Sep 30 12:10pm-1:00pm

25 1:10pm-Wumaier 26 1:10pm-Njus

27 2:10pm-Wumaier 28 2:10pm-Njus

This puzzle collection is closed book and closed notes. No sophisticated calculator is allowed for these puzzles. For full credit show all of your work (legibly!). Each puzzle is worth 10 points (a total of 50 points).

If you do not mark your section correctly, you will get -2 points.

Good luck!

Puzzle 1	Puzzle 2	Puzzle 3	Puzzle 4	Puzzle 5
/10	/10	/10	/10	/10

Total score
/50



1: Compute the following:

- $\frac{d}{dx} [x^3 + 4x - \sqrt{x} + x^e]$

- $\frac{d^2}{dx^2} [x^3 + 4x - \sqrt{x} + x^e]$

- $\frac{d}{dx} \left[ \frac{\sin(x^3)}{x} \right]$

- $\frac{d}{dx} [\cos(x) \cdot x \cdot e^x]$

- $\frac{d^{50}}{dx^{50}} [\cos(x)]$

2:

	$x=1$	$x=2$	$x=3$	$x=4$
$f(x)$	4	1	3	2
$f'(x)$	4	3	1	2
$g(x)$	3	2	4	1
$g'(x)$	2	3	4	1

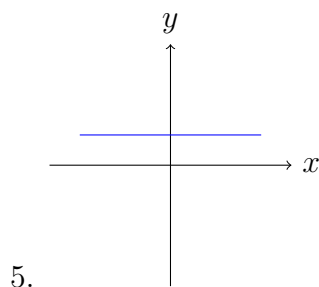
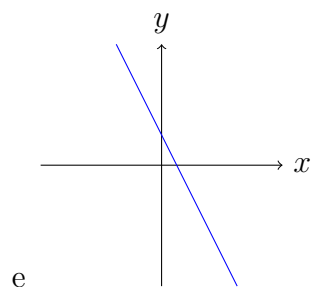
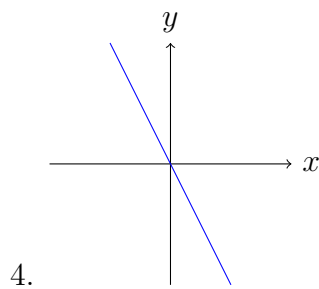
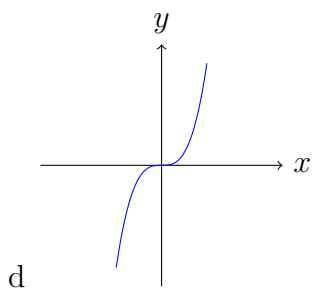
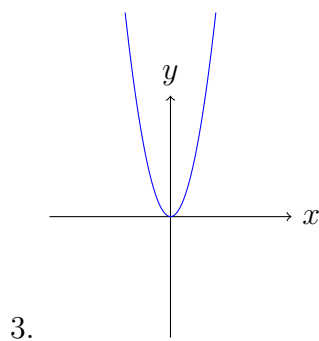
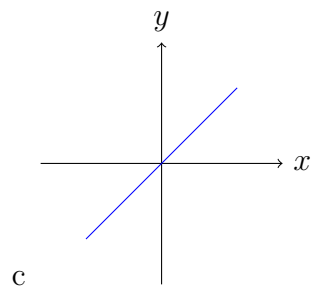
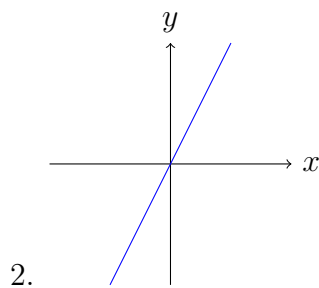
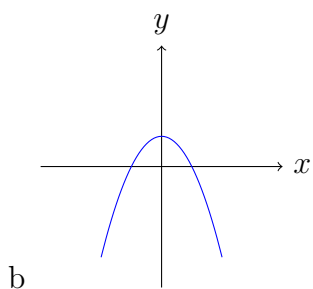
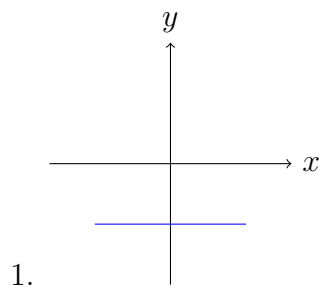
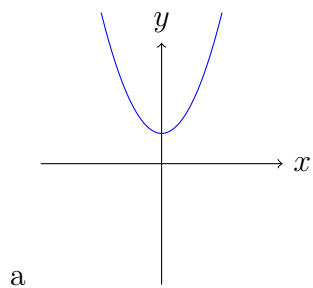
Compute the slope of the tangent line for  $h(x)$  at  $x = 2$  if

$$h(x) = \frac{f(g(x) - f(x))}{g(x)}$$

- 3:** Find the equation of the tangent line at  $(1, 1)$  to the following implicitly defined function.

$$4y^4 + 5x^9 = 3y + 6x$$

4: Match the function graphs (in left column) with the graphs of their derivatives (in right column).



a with \_\_\_\_\_ b with \_\_\_\_\_ c with \_\_\_\_\_ d with \_\_\_\_\_ e with \_\_\_\_\_

**5:** The Starkiller Base works by sucking a star and when the star is sucked, it shoots the remainders of the star to destroy other planets. The sucking of a star happens at rate  $-2$  and shooting happens at rate  $4$ . From the rate  $-2$  to rate  $4$  must be a smooth transition, otherwise the Starkiller Base explodes. Smooth transition means that the rate is continuous. Decide if the following transition function  $f$  from sucking to shooting was designed by a genuine First Order engineer or by a spy from the Resistance.

If you do not like stories, just decide if  $f$  is differentiable. Justify your answer.

$$f(t) = \begin{cases} -2t + 2 & t \leq -1, \\ t^2 & -1 < t < 2, \\ 4t - 4 & 2 \leq t. \end{cases}$$