Name: ....

23 12:10pm–Wumaier	24 12:10pm–Njus
25 1:10pm–Wumaier	26 1:10pm–Njus
27 2:10pm–Wumaier	28 2:10pm–Njus

MATH-165 **Puzzle Collection 3**

2016 Oct 28 12:10pm-1:00pm

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!). Every puzzle is worth 10 points (a total of 50 points).

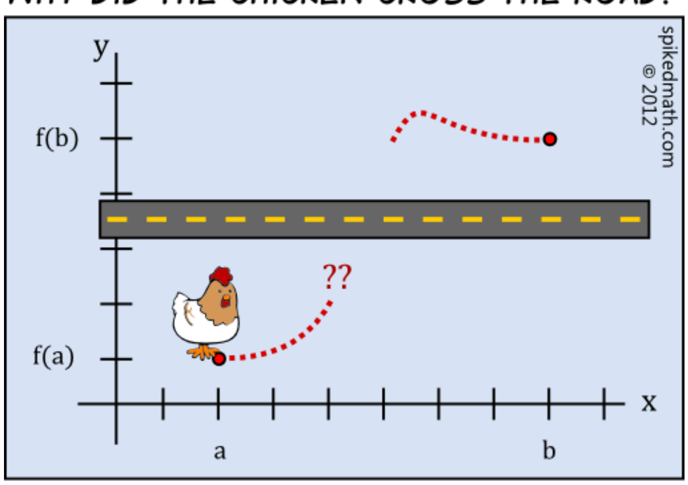
If you do not mark your section correctly, you will get -2 points.

Good luck!

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

Total score
/50

WHY DID THE CHICKEN CROSS THE ROAD?



THE INTERMEDIATE VALUE THEOREM.

1: Use linear approximation to **estimate** $\sqrt{17}$.
(If you just punch into the calculator $\sqrt{17}$ *and write the result, you will get 0 points.)*

$$\sqrt{17} \approx \underline{\hspace{3cm}}$$

2: Suppose that $h(x) = f(x)g(x)$ is an invertible differentiable function. Further suppose that we know the following information:

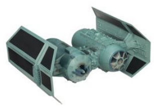
	x=1	x=2	x=5	x=9	x=12
$f(x)$	2	3	6	12	13
$f'(x)$	1	2	5	19	28
$g(x)$	5	4	3	2	2
$g'(x)$	-1	-2	-1	-3	-2

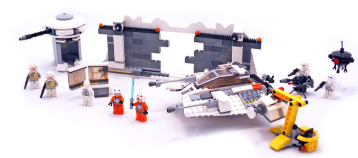
Find the tangent line to the curve $y = h^{-1}(x)$ at $x = 12$.
(Notice that $h^{-1}(x)$ is the inverse function to h. Not $\frac{1}{h(x)}$.)

Tangent line is: $y =$ ________ $x+$ ________

3: A Tie Bomber was spotted west of the rebel base. The bomber is flying east at a speed of 400kph, and its height is decreasing at 132kph. The ship is now 12km west and 5km high. The rebels can start shooting when the speed of the bomber relative to the base is under 410kph. Can the rebels start shooting yet?

(How fast is the ship moving relative to the rebel base?)





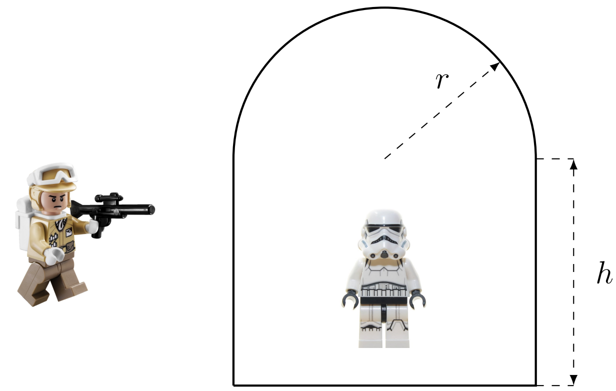
speed of ship = _______ Can rebels shoot? _______

4: Find and classify the critical points using the first derivative test and also list points of inflection for the function $f(x) = 2\arctan(x) + 2\ln(x^2 + 1) + x$.

Critical points (and their types):

Inflection points:

5: Rebels are trying to build a fenced in area for captured stormtroopers. For tactical reasons, the shape of the fence must be a rectangle, where one side is replaced by a half circle. See the diagram.



The rebels have 100 meters of fence material. What should be r and h that maximize the enclosed area? *(No need to simplify the answers too much.)*

$r =$ ________ $h =$ ________