**Question #1 – Mu Bowl \_\_\_\_\_\_\_\_\_ MA Nationals 2014**

Consider the point on the graph of that is nearest to the point . Let and minimum distance between and .

**What is ?**

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Consider the point on the graph of that is nearest to the point . Let and minimum distance between and .

**What is ?**

**Question #2 – Mu Bowl \_\_\_\_\_\_\_\_\_\_\_ MA Nationals 2014**

Let

Let

Let

**What is ?**

**Question #2 – Mu Bowl \_\_\_\_\_\_\_\_\_\_\_ MA Nationals 2014**

Let

Let

Let

**What is ?**

**Question #3 – Mu Bowl \_\_\_\_\_\_\_ MA Nationals 2014**

Let

Given that and , let

Let

**What is ?**

**Question #3 – Mu Bowl \_\_\_\_\_\_\_ MA Nationals 2014**

Let

Given that and , let

Let

**What is ?**

**Question #4 – Mu Bowl \_\_\_\_ MA Nationals 2014**

Let , where is a constant. **What is the value of ?**

**Question #4 – Mu Bowl \_\_\_\_ MA Nationals 2014**

Let , where is a constant. **What is the value of ?**

**Question #5 – Mu Bowl \_\_\_\_ MA Nationals 2014**

Assume . The graph is symmetric with respect the y-axis, has a relative maximum at , and has an absolute minimum at , where is a real number.

**What is**

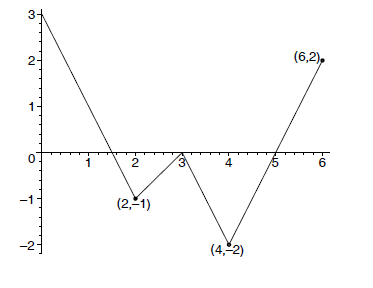
**Question #5 – Mu Bowl \_\_\_\_ MA Nationals 2014**

Assume . The graph is symmetric with respect the y-axis, has a relative maximum at , and has an absolute minimum at , where is a real number.

**What is**

**Question #6 – Mu Bowl \_\_\_\_\_\_\_\_\_\_\_\_MA Nationals 2014**

The graph below is the graph of . Note that . Suppose it is known that .



Let

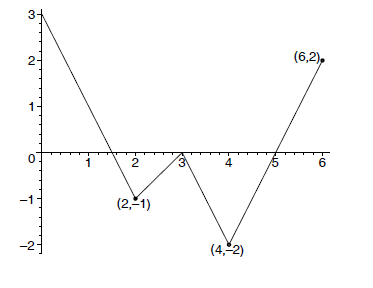
Suppose the minimum value of occurs at . Let

Let the number of inflection points that contains

**What is**

**Question #6 – Mu Bowl \_\_\_\_\_\_\_\_\_\_\_\_MA Nationals 2014**

The graph below is the graph of . Note that . Suppose it is known that .



Let

Suppose the minimum value of occurs at . Let

Let the number of inflection points that contains

**What is**

**Question #7 – Mu Bowl \_\_\_\_ MA Nationals 2014**

Let be the solution to the differential equation satisfying

**What is ?**

**Question #7 – Mu Bowl \_\_\_\_ MA Nationals 2014**

Let be the solution to the differential equation satisfying

**What is ?**

**Question #8 – Mu Bowl \_\_\_\_ MA Nationals 2014**

A point moves along a number line so that its position at time is .

Let the position of the point when it first changes direction

Let the time when the point reaches its minimum velocity

Let the acceleration of the point when it changes direction for the final time

**Find**

**Question #8 – Mu Bowl \_\_\_\_ MA Nationals 2014**

A point moves along a number line so that its position at time is .

Let the position of the point when it first changes direction

Let the time when the point reaches its minimum velocity

Let the acceleration of the point when it changes direction for the final time

**Find**

**Question #9 – Mu Bowl \_\_ MA Nationals 2014**

Consider the region bounded below by the graphs of and above by the line . The horizontal line cuts the region into two pieces of equal area. **What is**

**Question #9 – Mu Bowl \_\_ MA Nationals 2014**

Consider the region bounded below by the graphs of and above by the line . The horizontal line cuts the region into two pieces of equal area. **What is**

**Question #10 – Mu Bowl \_\_\_\_\_ MA Nationals 2014**

For each of the following statements, determine whether the statement is true or false. If the statement is true, assign it the value of the bolded number in front of that statement. Otherwise, assign the statement a value of -1. **What is the sum of these values?**

1. **2**: The property holds for
2. **3**:
3. **7**: The graph is concave up for all
4. **-3**: Regarding differentials, if , is increasing and differentiable, and ∆x > 0, then
5. **11:** If exists and is nonzero for all , then

**Question #10 – Mu Bowl \_\_\_\_\_ MA Nationals 2014**

For each of the following statements, determine whether the statement is true or false. If the statement is true, assign it the value of the bolded number in front of that statement. Otherwise, assign the statement a value of -1. **What is the sum of these values?**

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**Question #11 – Mu Bowl \_\_\_\_\_ \_ MA Nationals 2014**

Let be a second degree polynomial so that and . **What is the value of ?**

**Question #11 – Mu Bowl \_\_\_\_\_ \_ MA Nationals 2014**

Let be a second degree polynomial so that and . **What is the value of ?**

**Question #12 – Mu Bowl \_\_\_\_\_ \_ MA Nationals 2014**

Car A is traveling west at 50 miles per hour and car B is traveling north at 60 miles per hour. Both cars headed for the intersection between two roads. **At what rate are the cars approaching each other when car A is 0.3 miles and car B is 0.4 miles from the intersection?**

**Question #12 – Mu Bowl \_\_\_\_\_ \_ MA Nationals 2014**

Car A is traveling west at 50 miles per hour and car B is traveling north at 60 miles per hour. Both cars headed for the intersection between two roads. **At what rate are the cars approaching each other when car A is 0.3 miles and car B is 0.4 miles from the intersection?**

**Question #13 – Mu Bowl \_\_\_\_\_ MA Nationals 2014**

Let the volume of the solid generated by rotating the region bounded above by , below by and on the right by about the line .

Let , where

Let the slope of the tangent line of at the point

Let , where

**What is the value of ?**

**Question #13 – Mu Bowl \_\_\_\_\_ MA Nationals 2014**

Let the volume of the solid generated by rotating the region bounded above by , below by and on the right by about the line .

Let , where

Let the slope of the tangent line of at the point

Let , where

**What is the value of ?**

**Question #14 – Mu Bowl \_\_\_\_\_ \_\_\_\_\_\_\_\_ MA Nationals 2014**

Let be the *normal* line to at . Define

Using the definition of limits, let equal the which corresponds to for the limit .

**What is ?**

**Question #14 – Mu Bowl \_\_\_\_\_ \_\_\_\_\_\_\_\_ MA Nationals 2014**

Let be the *normal* line to at . Define

Using the definition of limits, let equal the which corresponds to for the limit .

**What is ?**