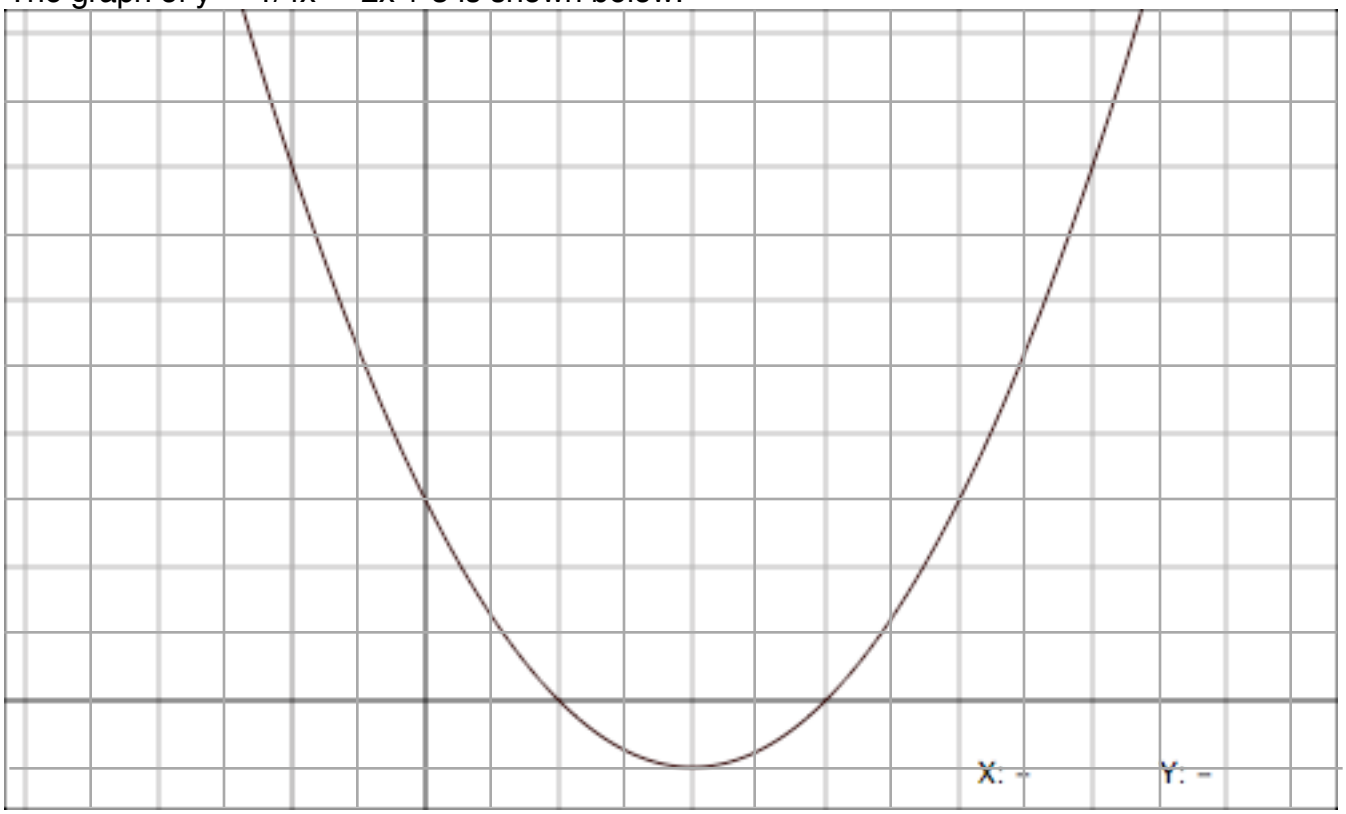
Name: _____ **TC**

Classwork 45

1. The graph of $y = 1/4x^2 - 2x + 3$ is shown below.



a) Where is the slope of the graph positive?

b) Where is the slope of the graph negative?

c) Where is the slope of the graph zero?

d) Use calculus to prove where the derivative equals zero.

e) Graph the derivative on the same graph above. How does this graph relate to your answers for part (a) and part (b) ?

f) Where is the slope of the graph equal to 2 ? Graph the tangent line to show your answer is correct.

g) What is the slope at x = 2 ? Graph the tangent line to show your answer is correct.

h) Reality check 1.... Find the (average) **slope** of the function over the interval $x = 1.999$ to $x = 2.001$. Make sure you use lots of decimals in your answer.

i) Reality check 2... Why is that the derivative, again? Use the **definition** of a derivative to prove that your derivative is correct.

2) Two numbers add up to 15. Maximize their product.
   a) Try a few examples. What do you predict for the answer?

   b) Use calculus to find the exact answer.

Checklist for solving Max/Min problems with calculus:

1)

2)

3)

4)

5)

6)

7)

8)

3. What point on the hyperbola $y = 1/x$ is closest to the origin?

a) Draw a graph on the calculator and hypothesize what the answer should be.

b) Use calculus to find the exact answer.

4. The Rowing Team is selling T-shirts for $15 each. Sales are averaging 10 shirts a day. The team lowers the price to $13 each and the sales go up to 11 shirts a day.

a) If the relationship between price and sales is linear, write an equation which describes how sales (y) depend on price (x).

b) Write an equation describing how revenue (r) depends on price (x).

c) If each shirt costs the team $6, write an equation describing how profit (p) depends on price (x).

d) What price should the team charge to maximize their profits?

5. In economics, demand is usually more hyperbolic. When the student council decides to have a bake sale to raise money for the senior prom, the calculus class decides that a more reasonable model of the relationship between **sales (y)** and **price (x)** would be $y = 25/x^2$

a) What is the **limit** of this function as the **price** of cake goes to ∞?

b) What is the **limit** of this function as the **price** of cake goes to 0 ?

c) Let's say each piece of cake costs the senior class $0.20 to supply. Write an expression for the **profit** gained from each individual piece of cake sold.

d) Write an equation relating **total profit (p)** to **price (x).**

e) Given this equation, what price should the senior class set in order to maximize profits?