Questions on Calculus

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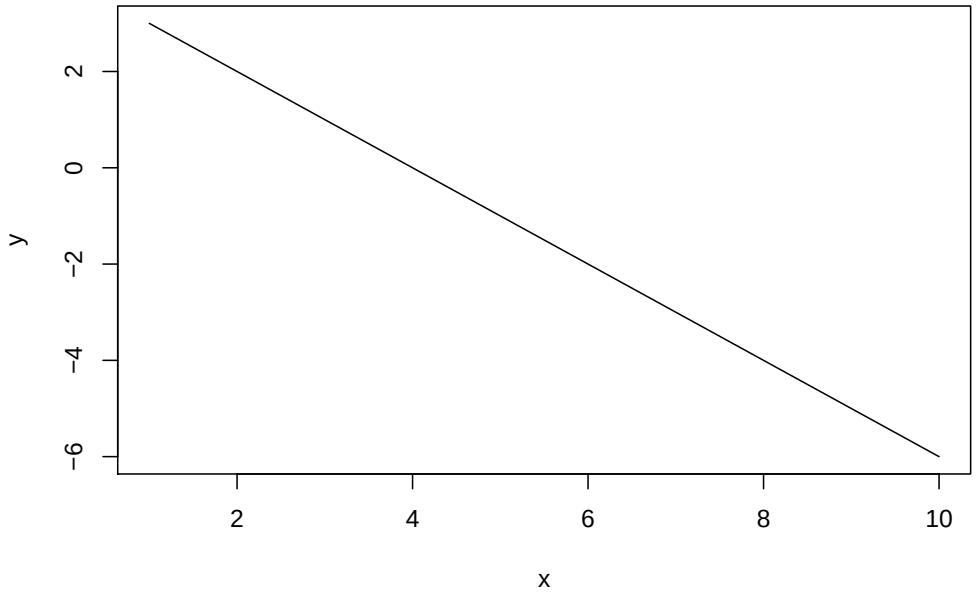


1. The equation for this line is $y = 4 - x$, what is the slope or gradient of the line?

2. What are the drivatives of

   - $y = 2 + 6x$

     $y' = 6$

- $y = 5 - 4x + 2x^3$

  $y' = -4 + 6x^2$

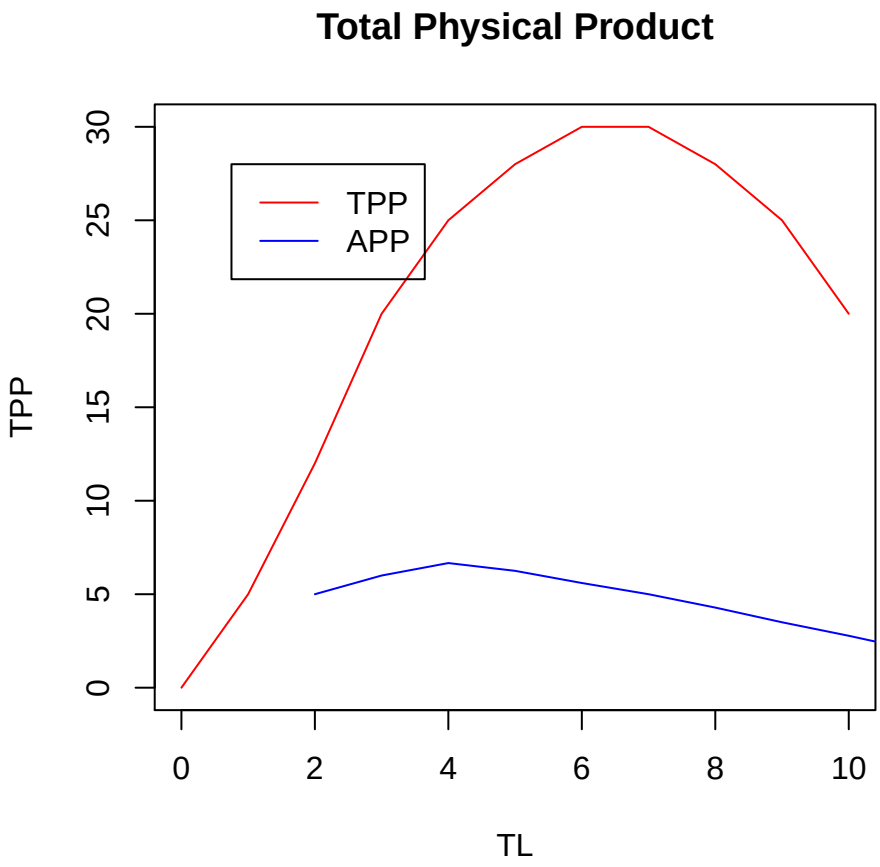
- $y = 25 + 6x^2 - 3x^3 + 25x^4$

  $y' = 12x - 9x^2 + 100x^3$

- $y - 3 = 2x$

  $y' = 2$

3. This is the total physical product curve from last week. How would you calculate the *average physical product*?



This would be any line between the origin and the TPP curve, and it is $\frac{TPP}{Q}$.

4. How would you calculate the *marginal physical product*?

   This is the gradient of the TPP, which would be $\frac{\Delta TPP}{\Delta Q}$

5. $TPP = 24 + 5Q + 2Q^2 - Q^3$

   $TPP' = 5 + 4Q - 3Q^2$

6. What does your answer to the prevous question tell you about the shape of the Total Physical Product Curve?

   It goes up initially but starts rise at a slower pace. There are diminishing returns.

   Differentiate

7. $TPP = 15 + 15Q + Q^2 - Q^3$

   $TPP' = 15 + 2Q - 3Q^2$

8. $TU = 25 + X_1 - X_1^2$

   $TU' = 1 - 2X_1$

9. $TU = 25 + 25X_1 - 2X_1^2$

   $TU' = 25 - 4X_1$

10. What does your answer to the previous question tell you about the shape of the Total Utility Curve?

    It shows that the utiity function is concave. There are diminishing returns.

11. What is the gradient of the TPP at its peak?

    Zero

12. What is the value of the MPP when TPP is at its peak?

    Zero

13. Given the $TPP = 100 + 32Q + 10Q^2 - Q^3$,

    - What is the TPP' or MPP?

      $MPP = 32 + 20Q - 3Q^2$

    - How would you find the maximum TPP?

      Find the value of Q for which the derivative or the MPP is zero.

14. Given the $TPP = 500 + 200L + L^2 - L^3$,

    - What is the TPP' or MPP?

      $MPP = 200 + 2L - 3L^2$

    - How would you find the maximum TPP?

      Set the marginal physical product equal to zero and solve the quadratic.

      $200 + 290L - 3L^2 = 0$

      $3L^2 - 290L - 200 = 0$

      $(3L + 2)(L - 100)$ Check and complete.

15. Given the $TU = 25X - 0.5X^2$

    - What is the drivative of TU?

      $TU = 25 - X$

- What can we say about the utility of X?

  There are diminishing returns.