Quiz #5—Solutions

Mathematics 140—Applied Calculus

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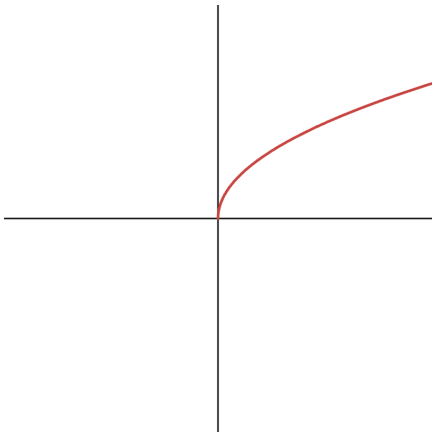
September 16, 2026

Directions: Carefully answer the questions below. Remember that your goal is to convince me that you know what is going on, so show your work! When relevant, round your final answers to 3 decimal places.

1. **Power Functions:** For each of the following functions:
   - Determine whether it is a power function.
   - If it is a power function, write it in the form $y = ax^p$ and identify the values of a and p.
   - Sketch a graph of the function.

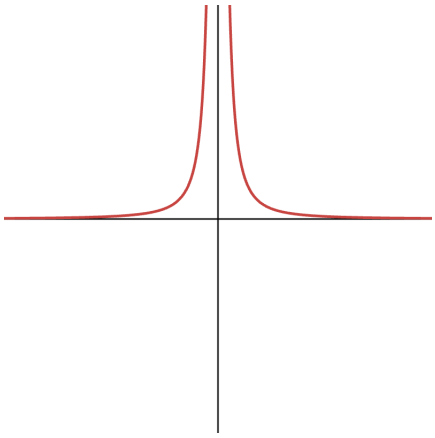
   (a) $y = 2\sqrt[4]{x}$

   Answer: It is a power function; $y = 2x^{1/4}$; $a = 2,\ p = \frac{1}{4}$.



   (b) $y = \dfrac{9}{x^6}$

   Answer: It is a power function; $y = 9x^{-6}$; $a = 9,\ p = -6$.



2. **Rate of Change:** If $r(5.2) = 7.1$ and the rate of change of r with respect to t is -0.23, then estimate:

   (a) $r(5.5)$

   Answer: We first note that $\dfrac{\Delta r}{\Delta t} = -0.23 \rightarrow \Delta r = -0.23 \cdot \Delta t$. Then, we note that $\Delta t = 5.5 - 5.2 = 0.3$ and so $\Delta r = -0.23 \cdot 0.3 = -0.069$. Therefore, the new value of r is $r(5.5) = 7.1 - 0.069 = 7.031$.

   (b) $r(4.8)$

   Answer: Similarly, $\Delta t = 4.8 - 5.2 = -0.4$ and $\Delta r = -0.23 \cdot -0.4 = 0.092$. Therefore, the new value of r is $r(4.8) = 7.1 + 0.092 = 7.192$.

(c) If we wish to determine r to within ± 0.005 of a unit, determine the tolerance on t.

Answer: We see that $\Delta r = -0.23 \cdot \Delta t$, and we want $\Delta r = \pm 0.005$. Therefore, we have $\pm 0.005 = -0.23 \cdot \Delta t \rightarrow \Delta t = \dfrac{\pm 0.005}{-0.23} = \mp 0.022$.