Arc Length:

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For a curve $x = f(y), a \leq y \leq b$ where $f'(y)$ is continuous, the length of the curve is given by:

1. Find the exact length of the curve given by $y = \frac{1}{2}x^2, 0 \leq x \leq 2$.
2. Find the exact length of the curve given by $x = y^{3/2}$, $0 \leq y \leq 1$.
3. Find the exact length of the curve given by $y = \ln\big(\sec(x)\big)$, $0 \leq x \leq \pi/4$.
4. Set up, but do not evaluate, an integral to find the length of $x = \cos(y)$ from $y = 0$ to $y = \pi$.
5. Set up, but do not evaluate, an integral to find the length of $y = \arccos(x)$ from $x = -1$ to $x = 1$.

Average Value: The average value of a function f on the interval $[a, b]$ is given by:

1. Find the average value of the function $f(x) = 4x - x^2$ on the interval $[0, 4]$.
2. Find the average value of the function $g(y) = \sqrt[3]{x}$ on the interval $[1, 8]$.
3. Find the average value of the function $h(x) = \big(\cos(x)\big)^4 \sin(x)$ on the interval $[0, \pi]$.
4. The velocity (ft/s) of an object at t seconds is given by $v(t) = t^3 - 3\ln(t + 1) + 1$. Find the average velocity of the object during the first second of motion.
5. **Challenge:** The single share price of stock in ATMOS is given by $p(t) = 4\sin(3t) + \dfrac{t^3}{2} - 2t^2 + 40$ where t is the number of days after April 5^{th}. Find the average price of ATMOS stock from April 5^{th} to April 9^{th}.