

DIGITLE – AB CALCULUS

Puzzle 131 – Differential Equations



Directions: The first 5 problems have single digit answers. The 6th problem has a 5-digit answer (counting leading zeros if present). You have a choice: solve the easier single-digit answer problems or tackle the more difficult 5-digit answer. Once you have done that, attempt to solve the puzzle by entering the following url on your computer, tablet, or phone:

<https://mastermathmentor.com/mmm/digitle.ashx>.

The correct puzzle answer will be the digits of your answer(s) scrambled. Use the following interpretation. You get 6 tries.

Green : the digit is in the answer and is in the correct spot.

Yellow: the digit is in the answer but is not in the correct spot.

Grey : the digit is not in the answer.

Single Digit Answers:

1) Suppose $\frac{dy}{dx} = \frac{y+2}{2x+y}$ for $-1 \leq x \leq 2$ and $-2 \leq y \leq 2$ where x and y are integers and $\frac{dy}{dx}$ is defined. At how many points is the graph of the function y decreasing?

2) If $3\frac{dy}{dx} = x - 3y + 1$, find the largest integer value of y where the graph of the solution to the differential equation is concave down when $x = 7$.

3) Let $f(x)$ be the equation of the line that is orthogonal (perpendicular) to $x^2y = 432$ at the point $(12, 3)$. Find $f(15)$.

4) If $f(x)f'(x) = 32e^x$ and $f(0) = 10$, find $\lim_{x \rightarrow -\infty} f(x)$

5) If $\frac{dy}{dt} = \frac{xy+x}{x^2+9}$ and $y(0) = 2$, find $y(4)$.

5-Digit Answer:

6) If the solution to $\frac{dy}{dx} = -\sqrt{xy}$ passes through $(0, 160,000)$, find the value of y when $x = 81$.