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Solve each of the following differential equations. (Use the given information to find the specific solution.) Show your work neatly organized.

1. $f'(x) = 4x + 5$; $f(-2) = 3$

2. $f'(x) = 2x^2 + 4x - 1$; $f(3) = 30$

3. $f''(x) = 12x - 2$; $f(0) = -1$; $f(2) = -5$

4. $f''(x) = -6x$; $f(-1) = 3$; $f(2) = 3$

Find the equation of the curve described in each of the following problems. Show your work neatly organized.

5. The slope, m , of the curve at any point (x, y) on the curve is given by the equation $m = -2x + 3$. The curve passes through the point $(2, 1)$.

6. The slope, m , of the curve at any point (x, y) on the curve is given by the equation $m = x^2 - 2x$. The curve has an x -intercept of -6 .

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Find the equation of the curve described in each of the following problems. Show your work neatly organized.

7. The slope, m , of the curve at any point (x, y) on the curve is given by the equation $m = 2x - 4$. The curve is tangent to the x -axis.

8. The second derivative of the curve is given by the equation $f''(x) = 6x - 2$. The curve is tangent to the line $y = -2x + 3$ at the point $(2, -1)$.

Solve each of the following.

9. A particle starts from rest and moves on a straight line with acceleration $a = 8 - 6t$ (ft/s^2), where $t \geq 0$. If it is 10 feet to the right of a fixed point P on the line when $t = 4\text{s}$, then find its speed and position relative to point P when $t = 6\text{s}$.

10. A stone is propelled upward from a point that is 150 feet above the ground. If the initial velocity of the stone is 70 fps, then a) how long will it take for the stone to hit the ground, and b) what will be its speed as it hits the ground? Express both answers rounded to 3 significant digits. Assume the acceleration due to gravity is a constant 32 ft/s^2 downward.