

For this sample, I have included more problems than usual. You should view this as more practice, not that the quiz will be twice as long as usual!

1. For what value of the constants a , b and c does the function

$$f(x) = \begin{cases} x^3 & x \leq 1 \\ ax^2 + bx + c & x > 1 \end{cases}$$

have a second derivative at $x = 1$?

2. Find the point(s) on the curve $x^2 - xy + y^2 = 3$ where the tangent line is parallel to $y = x$.
3. If $x^2 + y^2 = 2$, find y'' as a function of x and y . For full marks, find y'' as a function of y only.
4. Explorers on the airless planet Karibas used a spring gun to launch a ball bearing vertically upwards from the surface with a velocity of 15 m/s. The ball bearing reached its maximum height 20 seconds later. What is the acceleration due to gravity on Karibas?