2010 Q13

13. Given \( y = t^3 - \frac{5}{2} t^2 \) and \( x = \sqrt{t} \) for \( t > 0 \), use parametric differentiation to express \( \frac{dy}{dx} \) in terms of \( t \) in simplified form.

Show that \( \frac{d^2 y}{dx^2} = at^2 + bt \), determining the values of the constants \( a \) and \( b \).

Obtain an equation for the tangent to the curve which passes through the point of inflexion.

Answers

\[
\frac{dy}{dt} = 6t^2 - 10t^\frac{3}{2}
\]

\( a = 30, \quad b = -30 \)

\( 2y + 8x = 5 \)