$$y = \frac{r}{\sqrt{r^2+5}} \quad \Rightarrow$$

$$y' = \frac{\sqrt{r^2+5}\,(1) - r\cdot\frac{1}{2}(r^2+5)^{-1/2}(2r)}{\left(\sqrt{r^2+5}\,\right)^2} = \frac{\sqrt{r^2+5} - \dfrac{r^2}{\sqrt{r^2+5}}}{\left(\sqrt{r^2+5}\,\right)^2}$$

$$= \frac{\dfrac{\sqrt{r^2+5}\,\sqrt{r^2+5} - r^2}{\sqrt{r^2+5}}}{\left(\sqrt{r^2+5}\,\right)^2} = \frac{(r^2+5)-r^2}{\left(\sqrt{r^2+5}\,\right)^3} = \frac{5}{(r^2+5)^{3/2}}$$

or $5(r^2+5)^{-3/2}$

Another solution: Write y as a product and make use of the Product Rule.
$y = r(r^2+5)^{-1/2} \quad \Rightarrow$
$y' = r\cdot(-\frac{1}{2})(r^2+5)^{-3/2}(2r) + (r^2+5)^{-1/2}\cdot 1 = (r^2+5)^{-3/2}[-r^2+(r^2+5)^1] = (r^2+5)^{-3/2}(5) = 5(r^2+5)^{-3/2}$.
The step that students usually have trouble with is factoring out $(r^2+5)^{-3/2}$. But this is no different than factoring out x^2 from x^2+x^5; that is, we are just factoring out a factor with the *smallest* exponent that appears on it. In this case, $-\frac{3}{2}$ is smaller than $-\frac{1}{2}$.