Quiz # 4 THURSDAY 10/2

MATH 141 NAME ____________

① Calculate DERIVATIVES OF THE FOLLOWING FUNCTIONS

ⓐ $f(x) = x^2 e^x$ $\quad f'(x) = 2xe^x + x^2 e^x = (2+x)xe^x$

ⓑ $g(x) = \dfrac{3x-1}{2x+1}$ $\quad g'(x) = \dfrac{3(2x+1) - 2(3x-1)}{(2x+1)^2} = \dfrac{6x+3-6x+2}{4x^2+4x+1} = \dfrac{5}{(2x+1)^2}$

ⓒ $f(r) = (r^2 - 2r)e^r$ $\quad f'(r) = (2r-2)e^r + (r^2 - 2r)e^r = (r^2 - 2)e^r$

ⓓ $f(x) = \dfrac{x}{x + \frac{c}{x}}$ $\quad f'(x) = \dfrac{d}{dx}\left[\dfrac{1}{1+\frac{c}{x^2}}\right] = \dfrac{-d/dx\left[1+\frac{c}{x^2}\right]}{\left(1+\frac{c}{x^2}\right)^2} =$

$$= \frac{2cx^{-3}}{1 + 2cx^{-2} + c^2x^{-4}} = \frac{2cx}{x^4 + 2cx^2 + c^2} = \frac{2cx}{(x^2+c)^2}$$

② The POSITION FUNCTION OF A PARTICLE is GIVEN BY $s(t) = t^3 - 4.5t^2 - 7t$, $t \geq 0$.
When does the PARTICLE REACH A VELOCITY OF 5 m/s?

$v(t) = \dfrac{d}{dt} s(t) = 3t^2 - 9t - 7$ $\qquad v(t) = 5 \Rightarrow$

$3t^2 - 9t - 7 = 5 \iff 3t^2 - 9t - 12 = 0 \iff t^2 - 3t - 4 = 0$

$\iff (t-4)(t+1) = 0.$

Since we consider only $t \geq 0$, we get

$$\boxed{t = 4}$$