Name_____ Section_____

NOTE: You may NOT use a calculator for this quiz.

Find the derivative (y') for each of the following three functions and simplify as much as possible:

1) $y = 10 \cdot e^{0.7x}$ *(2 points)*

$$y' = D_x\left[10 \cdot e^{0.7x}\right] = 10 \cdot D_x\left[e^{0.7x}\right]$$
$$y' = 10 \cdot e^{0.7x} \cdot D_x\left[0.7x\right]$$
$$y' = 10 \cdot e^{0.7x} \cdot 0.7$$
$$\boxed{y' = 7 \cdot e^{0.7x}}$$

2) $y = x\ln\left(x^2\right)$ *(3 points)*

$$y' = D_x\left[x\ln\left(x^2\right)\right] = x \cdot D_x\left[\ln\left(x^2\right)\right] + \ln\left(x^2\right) \cdot D_x\left[x\right]$$
$$y' = x \cdot \frac{1}{x^2} \cdot D_x\left[x^2\right] + \ln\left(x^2\right) \cdot 1$$
$$y' = x \cdot \frac{1}{x^2} \cdot 2x + \ln\left(x^2\right)$$
$$\boxed{y' = 2 + \ln\left(x^2\right)}$$

3) $y = \dfrac{\ln\left(x^2\right)}{x^2}$ *(3 points)*

$$y' = D_x\left[\frac{\ln\left(x^2\right)}{x^2}\right] = \frac{x^2 \cdot D_x\left[\ln\left(x^2\right)\right] - \ln\left(x^2\right) \cdot D_x\left[x^2\right]}{\left(x^2\right)^2}$$
$$y' = \frac{x^2 \cdot \frac{1}{x^2} \cdot D_x\left[x^2\right] - \ln\left(x^2\right) \cdot 2x}{x^4}$$
$$y' = \frac{2x - \ln\left(x^2\right) \cdot 2x}{x^4}$$
$$\boxed{y' = \frac{2 - 2 \cdot \ln\left(x^2\right)}{x^3}}$$

4) Find the equation of the line which is tangent to the graph of $y = x\ln\left(x^2\right)$ at $x = 1$ *(2 points)*.

At $x = 1$, $y = 0$ and $y' = 2 + \ln\left(1^2\right) = 2 + 0 = 2$.

The equation of the tangent line has the form: $y = m \cdot x + b$

$m = y'(1) = 2$
$y = m \cdot x + b \Rightarrow 0 = 2 \cdot 1 + b \Rightarrow b = -2$

So the equation of the tangent line is: $\boxed{y = 2 \cdot x - 2}$