Name: ______________________________________ Date: ______

PCH – "e" and "ln" in Preparation for Calculus

Many questions in Calculus require you to work with "e" and "ln". The following questions will help you brush up on the skills you will need in this area next year.

1. Given $h(x)=5x+4e^x$ find $h(0)$. Simplify your answer.

$h(0)=5(0)+4e^0 = 4$

2. Solve for x: $\ln 3-\frac{1}{3}\ln x=0$

$\ln 3=\ln x^{\frac{1}{3}}$

$3=x^{\frac{1}{3}}$

$27=x$

3. Solve for x: $\ln x=3$

$x=e^3$

4. Given $r(x)=\frac{1}{8}e^{\frac{x}{8}}$, find $r(8\ln 5)$, find in simplest form.

$r(8\ln 5)=\frac{1}{8}e^{\frac{8\ln 5}{8}}=\frac{1}{8}e^{\ln 5}$

$\frac{1}{8}(5)=\frac{5}{8}$

5. Solve for x: $\underbrace{\ln e^2+\ln e^3}=x$. Express your answer in simplest form.

$\ln e^5=x$

$5=x$

6. Given $g(x)=\frac{1}{\left(x+6+e^{-5x}\right)}\cdot\left(1-5e^{-5x}\right)$, find $g(0)$ in simplest form.

$$g(0)=\frac{1}{0+6+e^{-5(0)}}\cdot 1-5e^{-5(0)} = \frac{-4}{7}$$

7. Solve for x: $e^{4x}+4e^{2x}-21=0$.

$$(e^{2x}+7)(e^{2x}-3)=0$$

$e^{2x}+7=0$

$e^{2x}\neq-7$

impossible

$e^{2x}-3=0$

$e^{2x}=3$

$\ln 3=2x$

$x=\frac{\ln 3}{2}$

8. Solve for x: $3xe^{x}+x^{2}e^{x}=0$.

$$xe^{x}(3+x)=0$$

$xe^{x}=0$

$x=0$

$3+x=0$

$x=-3$

9. Find the value of k for which $f(x)=0$ when $x=\frac{3}{5}$ given $f(x)=x^2ke^{kx}+3xe^{kx}$.

$f(x) = xe^{kx}(xk+3)$

$0 = \frac{3}{5}e^{k(\frac{3}{5})}\left(\frac{3}{5}k+3\right)$

$\frac{3}{5}e^{\frac{3k}{5}} = 0$ | $5\left(\frac{3}{5}k+3=0\right)$

impossible | $3k+15=0$

$\boxed{k=-5}$

10. Given $\ln(y)=\ln(3x+1)+c$ and $y(0)=e$.

(a) Find C.

$\ln y = \ln(3x+1) + c$

$\ln e = \ln(3(0)+1) + c$

$1 = \ln 1 + c$

$1 = 0 + c$

$y(0) = e$

plug in $(0, e)$

$c = 1$

(b) Using this value of C, show the work that would lead to how this equation leads to $y=3xe+e$.

$\ln y = \ln(3x+1) + 1$

$e^{\ln y} = e^{\ln(3x+1)+1}$

$y = e^{\ln(3x+1)} e^{1}$

$y = e(3x+1) = 3xe+e$

11. Given $-e^{-y}=e^{x}+C$

(a) Find C if $y(0)=-\ln 2$

$(0, -\ln 2)$

$-e^{\ln 2} = e^{0} + c$

$-e^{\ln 2} = 1 + c$

$e^{\ln 2} = -1 - c$

$2 = -1 - c$

$-c = 3$

$c = -3$

(b) Using this value of C, rewrite the equation in the form "$y=$".

$-e^{-y} = e^{x} - 3$

$e^{-y} = -e^{x} + 3$

$\ln e^{-y} = \ln(-e^{x}+3)$

$-y = \ln(-e^{x}+3)$

$y = -\ln(-e^{x}+3)$

$-e^{x}+3>0$

$-e^{x}>-3$