Mathematics 122 **Quiz 23** **Name:** Key

Let a and b be constants. Compute the following derivatives:

1 pt (1) $y = x^2 e^x$ $\qquad y' = 2xe^x + x^2 e^x$

$y' = (x^2)' e^x + x^2 (e^x)'$

$= 2x e^x + x^2 e^x$

1 pt (2) $S = t\ln(t)$ $\qquad \dfrac{dS}{dt} = \ln(t) + 1$

$\frac{dS}{dt} = t' \ln(t) + t \ln(t)'$

$= 1 \ln(t) + t \frac{1}{t}$

1 pt (3) $w = 4z^7(z+1)^9$ $\qquad \dfrac{dw}{dz} = 28z^6(z+1)^9 + 36z^7(z+1)^8$

$\frac{dw}{dz} = (4z^7)'(z+1)^9 + 4z^7((z+1)^9)'$

$= 28z^6(z+1)^9 + 4z^7(9)(z+1)^8$

1 pt (4) $y = \dfrac{e^x}{(x+1)^2} = (x+1)^{-2}e^x$ $\qquad \dfrac{dy}{dx} = -2(x+1)^{-3}e^x + (x+1)^{-2}e^x$

Method I $y' = \dfrac{(e^x)'(x+1)^2 - e^x((x+1)^2)'}{((x+1)^2)^2}$

$= \boxed{\dfrac{e^x(x+1)^2 - e^x 2(x+1)}{(x+1)^4}}$

Method II

$y' = ((x+1)^{-2})' e^x + (x+1)^{-2}(e^x)'$

$= -2(x+1)^{-3}e^x + (x+1)^{-2}e^x$

1 pt (5) $A(r) = \dfrac{r+1}{r-1}$ $\qquad A'(r) =$ ________

Method I

$A'(r) = \dfrac{(r+1)'(r-1) - (r+1)(r-1)'}{(r-1)^2}$

$= \dfrac{1\cdot(r-1) - (r+1)}{(r-1)^2}$

$= \dfrac{-2}{(r-1)^2}$

Method II

$A(r) = (r-1)^{-1}(r+1)$

$A'(r) = ((r-1)^{-1})'(r+1) + (r-1)^{-1}(r+1)'$

$= -(r-1)^{-2}(r+1) + (r-1)^{-1}(1)$

$= -(r-1)^{-2}(r+1) + (r-1)^{-1}$