MAT126.R01: QUIZ 3

SOLUTIONS

Differentiate the following functions:

(a) $f(x) = \dfrac{2x}{\sqrt{x+1}}$

$\left(\dfrac{2x}{\sqrt{x+1}}\right)' = \dfrac{(2x)'\sqrt{x+1} - 2x(\sqrt{x+1})'}{(\sqrt{x+1})^2} = \dfrac{2\sqrt{x+1} - 2x\frac{1}{2\sqrt{x+1}}}{x+1} = \dfrac{2(x+1)-x}{(x+1)\sqrt{x+1}} = \dfrac{x+2}{(x+1)^{3/2}}$

using the chain rule to differentiate $\sqrt{x+1}$*:* $u = x+1$ *and* $(x+1)' = 1$, $(\sqrt{u})' = \dfrac{1}{2\sqrt{u}}$.

(b) $g(t) = \cos(\ln(t+1))$

$(\cos(\ln(t+1)))' = -\sin(\ln(t+1))\dfrac{1}{t+1} = -\dfrac{\sin(\ln(t+1))}{t+1}$

using the chain rule with $u = \ln(t+1)$*:*

$(\ln(t+1))' = \dfrac{1}{t+1}$ *(this uses another chain rule with* $u = t+1$ *and* $(\ln u)' = \frac{1}{u}$*) and* $(\cos u)' = -\sin u$.

(c) $w(z) = z^3 e^z$

$(z^3e^z)' = (z^3)'e^z + z^3(e^z)' = 3z^2e^z + z^3e^z = (3z^2 + z^3)e^z$