Homework 12.

11.1 $z = f(y + 2x) + g(y + 3x)$
11.3 $w = f(x - y) + g(x + y)$
11.6 $d^2y/dz^2 + dy/dz - 5y = 0$
11.7 Use $dy/dx = (dy/d\theta)(d\theta/dx)$ and $d\theta/dx = -1/\sin(x)$.
11.8 Use $dy/dx = (dy/du)(du/dx) = (dy/du)(2/u)$ for any y.
11.9 $\partial/\partial s = x\partial/\partial x + y\partial/\partial y$ and $\partial/\partial t = -y\partial/\partial x + x\partial/\partial y$. So $(\partial/\partial s)^2 = x^2(\partial/\partial x)^2 + x(\partial/\partial x) + 2xy(\partial/\partial x)(\partial/\partial y) + y^2(\partial/\partial y)^2 + y(\partial/\partial y)$ and $(\partial/\partial t)^2 = x^2(\partial/\partial x)^2 - x(\partial/\partial x) - 2xy(\partial/\partial x)(\partial/\partial y) + y^2(\partial/\partial y)^2 - y(\partial/\partial y)$. Therefore $(\partial/\partial s)^2 + (\partial/\partial t)^2 = (x^2 + y^2)((\partial/\partial x)^2 + (\partial/\partial y)^2) = e^{2s}((\partial/\partial x)^2 + (\partial/\partial y)^2)$.
12.1 $\sin(x)/2\sqrt{x}$
12.2 $(\partial s/\partial v) = (1 - e^v)/v$ (limit -1) and $(\partial s/\partial u) = -(1 - e^u)/u$ (limit 1).
12.3 $-\sin(\cos(x))\tan(x) - \sin(\sin(x))/\tan(x)$
12.4 $\sin(2)/2$
12.7 $(\partial u/\partial x)_y = -e^4$, $(\partial u/\partial y)_x = e^4/\log(2)$, $(\partial y/\partial x)_u = \log(2)$.
12.8 $du/dx = e^{-x^2}$, so $dx/du = e^{x^2}$.