1. $\dfrac{dz}{dt} =$
   (a) $(2x+y)e^t + x(\cos t)$.
   (b) $(x\cos t - y\sin t)$

2. $\dfrac{\partial z}{\partial u} = 2(x\cos v + y\sin v)$ and $\dfrac{\partial z}{\partial v} = 2u(y\cos v - x\sin v)$

3. (a) $\dfrac{dy}{dx} =$
   i. $\dfrac{yx^{y-1} - y^x\ln(y)}{xy^{x-1} - x^y\ln(x)}$
   ii. $-\dfrac{y}{x}\left(\dfrac{\cos xy - e^{xy} - 2x}{\cos xy - e^{xy} - x}\right)$
   iii. $= -\dfrac{e^y + ye^x - ye^{xy}}{xe^y + e^x - xe^{xy}}$
   iv. $-\left(\dfrac{y}{x}\right)^{\frac{1}{3}}$

   (b) i. $\dfrac{\partial z}{\partial x} = \dfrac{z^2e^{xz^2} - y^2z^2}{2xy^2z + y\cos yz - 2xze^{xz^2}}$,
   $\dfrac{\partial z}{\partial y} = -\dfrac{2xyz^2 + z\cos yz}{2xy^2z + y\cos yz - 2xze^{xz^2}}$
   ii. $\dfrac{\partial z}{\partial x} = -\dfrac{tan^{-1}(\frac{y}{z}) - \frac{yz}{x^2+z^2} + \frac{yz}{x^2+y^2}}{tan^{-1}(\frac{x}{y}) - \frac{yx}{y^2+z^2} + \frac{xy}{z^2+x^2}}$
   $\dfrac{\partial z}{\partial y} = -\dfrac{tan^{-1}(\frac{z}{x}) - \frac{xz}{x^2+y^2} + \frac{xz}{y^2+z^2}}{tan^{-1}(\frac{x}{y}) - \frac{xy}{y^2+z^2} + \frac{xy}{x^2+z^2}}$

4. (a) Homogeneous of degree 0.
   (b) Homogeneous of degree 2.
   (c) Homogeneous of degree $\frac{1}{20}$.
   (d) Not Homogeneous.
   (e) Homogeneous of degree 2.

5. Use chain rule differentiation with two variables.

6. Use Euler's theorem.

7. Use Euler's theorem to the function $z = \sin u$.

8. Use Euler's theorem to the function $z = fu$.

9. Compute first and second order partial derivatives.

10. Use Euler's theorem to the function z.

11. Use Euler's theorem to the function $f = \tan u$.
12. Use Euler's theorem to the function $f = \sin u$.
13. Use Euler's theorem to the function $U = \dfrac{(ax^3 + by^3)^n}{3n(3n-1)}$ and $V = xf(\frac{y}{x})$.
14. Use Euler's theorem to the function $\alpha = x^m f(\frac{y}{x})$ and $\beta = y^n g(\frac{x}{y})$.
15. Compute first and second order partial derivatives of u.
16. Use Euler's theorem to the function $\alpha = x\phi(\frac{y}{x})$ and $\beta = \psi(\frac{x}{y})$.
17. Use Euler's theorem to the function $\alpha = \dfrac{(x^2 + y^2)^n}{2n(2n-1)}$ and $\beta = x\phi(\frac{y}{x})$ and $\gamma = \psi(\frac{y}{x})$.
18. Compute partial derivatives of u with respect to r and θ.
19. Compute partial derivatives of z with respect to r and θ.