#s 1 - 3: Identify the inner function $u = g(x)$ and the outer function $y = f(u)$, then find the derivative $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$.

1. $y = \sqrt[3]{1+4x}$
2. $y = \tan(\pi x)$
3. $y = \sqrt{\sin(x)}$

#s 4 - 16: Find the derivative.

4. $F(x) = \left(x^4 + 3x^2 - 2\right)^5$
5. $F(x) = \sqrt{-2x+1}$
6. $f(z) = \frac{1}{z^2+1}$
7. $y = \cos\left(x^3 + a^3\right)$
8. $y = x\sec(kx)$
9. $f(x) = (2x-3)^4\left(x^2+x+1\right)^5$
10. $h(t) = (t+1)^{2/3}\left(2t^2-1\right)^3$
11. $y = \left(\frac{x^2+1}{x^2-1}\right)^3$
12. $y = \sin(x\cos(x))$
13. $F(z) = \sqrt{\frac{z-1}{z+1}}$
14. $y = \frac{r}{\sqrt{r^2+1}}$
15. $y = \sin\left(\sqrt{x^2+1}\right)$
16. $y = \sin(\tan(2x))$

17. Consider the curve $y = \tan\left(\frac{\pi x^2}{4}\right)$.

   a. Find an equation of the tangent line to the curve @ $(1,1)$.

   b. Illustrate what you did, with a graph.

18. If g is twice-differentiable and $f(x) = x\,g\left(x^2\right)$, find f'' in terms of g, g' and g''.

19. Find $D^{103}(\cos(2x))$ by seeing the pattern