Differentiation

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1. If the radius of the circle is increasing at the rate of $0.5cm/s$, then the rate of increase of its circumference is.
2. Differentiate $sec^2(x^2)$ with respect to x^2.
3. If $y = f(x^2)$ and $f'(x) = e^{\sqrt{(x)}}$,then find $\frac{dy}{dx}$.
4. Find $f'(x)$ if $f(x) = (tanx)^{tanx}$.
5. If $f(x) = \sqrt{\frac{secx-1}{secx+1}}$,find $f'(\frac{\pi}{3})$
6. If $tan^{-1}\frac{y}{x} = log\sqrt{x^2+y^2}$,prove that $\frac{dy}{dx} = \frac{x+y}{x-y}$.
7. If $y = e^{acos^{-1}x}$,$-1 < x < 1$,then show that

$$(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2y = 0 \tag{1}$$