A Trifecta of Trig Substitutions

Use substitution and trig identities to compute the following integrals. In each problem, draw a right triangle to help illustrate your substitution.

1. $\displaystyle\int \frac{dx}{\sqrt{a^2-x^2}}$ *Hint:* $\sin^2\theta+\cos^2\theta=1$.

2. $\displaystyle\int \frac{dx}{x^4\sqrt{x^2-9}}$ *Hint:* $1+\tan^2=\sec^2\theta$, *so* $\sec^2\theta-1=\tan^2\theta$.

3. $\displaystyle\int \frac{x^2}{x^2+25}\,dx$ *Hint:* $1+\tan^2=\sec^2\theta$. *Also, from lecture:* $\displaystyle\int\tan^2\theta=\tan\theta-\theta+C$.