MULTIPLE ANGLES IN TERMS OF TAN^{-1} (X)

$$2\tan^{-1}x = -\pi + \tan^{-1}\frac{2x}{1-x^2}, x < -1$$
$$= \tan^{-1}\frac{2x}{1-x^2}, -1 < x < 1$$
$$= \pi + \tan^{-1}\frac{2x}{1-x^2}, x > 1$$

$$3\tan^{-1}x = -\pi + \tan^{-1}\frac{3x-x^3}{1-3x^2}, x < -\frac{1}{\sqrt{3}}$$
$$= \tan^{-1}\frac{3x-x^3}{1-3x^2}, -\frac{1}{\sqrt{3}} < x < \frac{1}{\sqrt{3}}$$
$$= \pi + \tan^{-1}\frac{3x-x^3}{1-3x^2}, x > \frac{1}{\sqrt{3}}$$