1) $f(x) = 3x^2 + 18x + 8$

$= 3(x+3)^2 - 19$

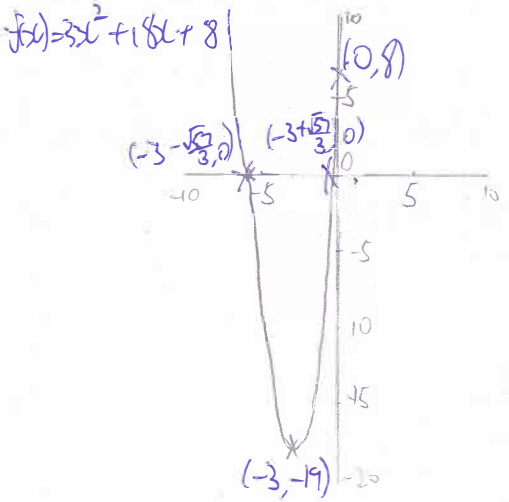
$\text{Vertex}_{f(x)} = (-3, -19)$

$f(x) = 0$

$x = -3 \pm \frac{\sqrt{57}}{3}$

$f(0) = 8$

$\text{Ran}(f) = [-19, \infty)$ //



2) $3x^3 + 4x^2 - 17x - 6 = (x-2)(3x^2+10x+3)$

$= (x-2)(3x+1)(x+3)$ //

3) Let $\frac{x^2+11x+20}{(x-1)(x+3)^2} = \frac{A}{x-1} + \frac{B}{x+3} + \frac{C}{(x+3)^2}$

$x^2+11x+20 = A(x+3)^2 + B(x-1)(x+3) + C(x-1)$

$= Ax^2 + 6Ax + 9A + Bx^2 + 2Bx - 3B + Cx - C$

$\begin{cases} A + B = 1 \\ 6A + 2B + C = 11 \\ 9A - 3B - C = 20 \end{cases} \Rightarrow \begin{cases} A = 2 \\ B = -1 \\ C = 1 \end{cases}$

$\frac{x^2+11x+20}{(x-1)(x+3)^2} = \frac{2}{x-1} - \frac{1}{x+3} + \frac{1}{(x+3)^2}$ //

$r\cos(x+\alpha) = r(\cos(x)\cos(\alpha) - \sin(x)\sin(\alpha))$

$= r\cos(x)\cos(\alpha) - r\sin(x)\sin(\alpha)$

$3\cos(x) - 4\sin(x) \equiv r\cos(x)\cos(\alpha) - r\sin(x)\sin(\alpha)$

$3\cos(x) = r\cos(x)\cos(\alpha)$

$\cos(\alpha) = \frac{3}{r}$

$-4\sin(x) = -r\sin(x)\sin(\alpha)$

$\sin(\alpha) = \frac{4}{r}$

$\frac{\sin(\alpha)}{\cos(\alpha)} = \frac{4/r}{3/r}$

$\tan(\alpha) = \frac{4}{3}$

$\alpha = 0,9273$

$\sin(0,9273) = \frac{4}{r}$

$r = 5$

$3\cos(x) - 4\sin(x) = 5\cos(x + \tan^{-1}(\frac{4}{3}))$

$= 5\cos(x + 0,9273)$ //

5) $3\cos(x) - 4\sin(x) = \frac{5}{2}$

$5\cos(x + \tan^{-1}(\frac{4}{3})) = \frac{5}{2}$

$\cos(x + \tan^{-1}(\frac{4}{3})) = \frac{1}{2}$

$x + \tan^{-1}(\frac{4}{3}) = 2\pi n \pm \cos^{-1}(\frac{1}{2})$ for $n \in Z$

$x = 2\pi n \pm \frac{\pi}{3} - \tan^{-1}(\frac{4}{3})$

$x = 2\pi n - 1,9745 + 2\pi$ or $x = 2\pi n + 0,1199$ //

$= 2\pi n + 4,3087$ //

6) $\sin(3\theta) = \cos(2\theta)$

$\sin(3\theta) - \sin(90° - 2\theta) = 0$

$2\cos(\frac{3\theta + \frac{\pi}{2} - 2\theta}{2})\sin(\frac{3\theta - (\frac{\pi}{2} - 2\theta)}{2}) = 0$

$\cos(\frac{\frac{\pi}{2} + \theta}{2}) = 0$

$\frac{\frac{\pi}{2} + \theta}{2} = 2\pi n \pm \cos^{-1}(0)$

$\theta = 4\pi n \pm \pi - \frac{\pi}{2}$

$\theta = 4\pi n + \frac{\pi}{2}$ or $\theta = 4\pi n - \frac{3}{2}\pi$

$= 2\pi n + \frac{\pi}{2}$ $= 2\pi n + \frac{\pi}{2}$

or $\sin(\frac{5\theta - \frac{\pi}{2}}{2}) = 0$

$\frac{5\theta - \frac{\pi}{2}}{2} = n\pi + (-1)^n \sin^{-1}(0)$ for $n \in Z$

$\theta = \frac{2n\pi + \frac{\pi}{2}}{5}$

$= \frac{2\pi}{5}n + \frac{\pi}{10}$ //