

Answer all of the following questions . Each question is worth 10 points

Calculators are not allowed.

1. (a) Solve the inequality:  $\frac{3x^2 + 4x + 2}{(x^2 - 4)|x - 3|} > 0$

(b) Find the equation of the circle with center (3,-2) and tangent to y-axis.

2. (a) If  $f(x) = \sqrt{x^3 + 1}$  and  $g(x) = \sqrt[3]{x^2 - 2x}$

Find  $(f \circ g)(x)$  and its domain

(b) Evaluate the following limit (if exists)

$$\lim_{x \rightarrow 1} \frac{5|x - 1|}{x^2 + x - 2}$$

3. (a) Use the definition of the limit to prove that

$$\lim_{x \rightarrow -4} \left( \frac{-x}{2} + 3 \right) = 5$$

(b) If  $f(x)$  satisfies the inequality  $(3 - |x - 4|) \leq f(x) \leq (x - 1)$ . Find  $\lim_{x \rightarrow 3} x^2 f(x)$

4. (a) Solve the following equation for  $\theta \in [0, 2\pi)$

$$\cos 2\theta + \sin 2\theta = 1$$

(b) Show that  $\frac{\tan x + \sin x}{1 + \cos x} = \tan x$

Good Luck.