ASSIGNMENTS #1
SOLUTIONS
NYA CALCULUS
ELECTRONICS ENGINEERING
JANUARY 29th 2012

VERSION B

EVALUATE THE FOLLOWING LIMITS

[QUESTION 1]

(i) $\lim_{x\to 1} x-7 = \boxed{-6}$

(ii) $\lim_{x\to 4} \frac{16-x^2}{4-x} = \lim_{x\to 4} \frac{(4-x)(4+x)}{(4-x)}$

$= \lim_{x\to 4} 4+x$

$= \boxed{8}$

(iii) $\lim_{x\to 1} \frac{x+2}{x^2+4x+4} = \lim_{x\to 1} \frac{x+2}{(x+2)^2} = \lim_{x\to 1} \frac{1}{x+2} = \boxed{\frac{1}{3}}$

[QUESTION 2]

(i) Find $\lim_{x\to -3} \frac{(x^2+7x+12)(x-1)}{(x+3)}$

$= \lim_{x\to -3} \frac{(x+4)(x+3)(x-1)}{(x+3)}$

$= \lim_{x\to -3} (x+4)(x-1)$

$= (1)(-4) = -4$

(ii) Graph $f(x) = \frac{(x^2+7x+12)(x-1)}{(x+3)}$

SOLN.

THIS IS ESSENTIALLY THE QUADRATIC $f(x) = (x+4)(x-1)$ WITH A "HOLLOW DOT" AT $x=-3$

VERTEX: $f(x) = (x+4)(x-1)$
$= x^2+3x-4$

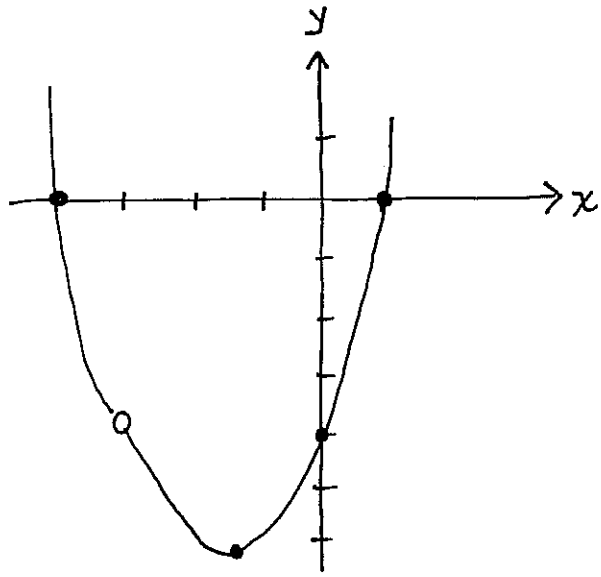
$x = -b/2a = -3/2 = -1.5$

$y = (-3/2)^2 + 3(-3/2) - 4$
$= 9/4 - 9/2 - 4 = -25/4$

VERTEX $(-1.5, -6.25)$

x-INTERCEPTS $(-4,0)\ (1,0)$

y-INTERCEPT $(0,-4)$



[QUESTION 3]

SKETCH A FUNCTION THAT SATISFIES THE FOLLOWING:

$\lim_{x \to \infty} f(x) \to -\infty$

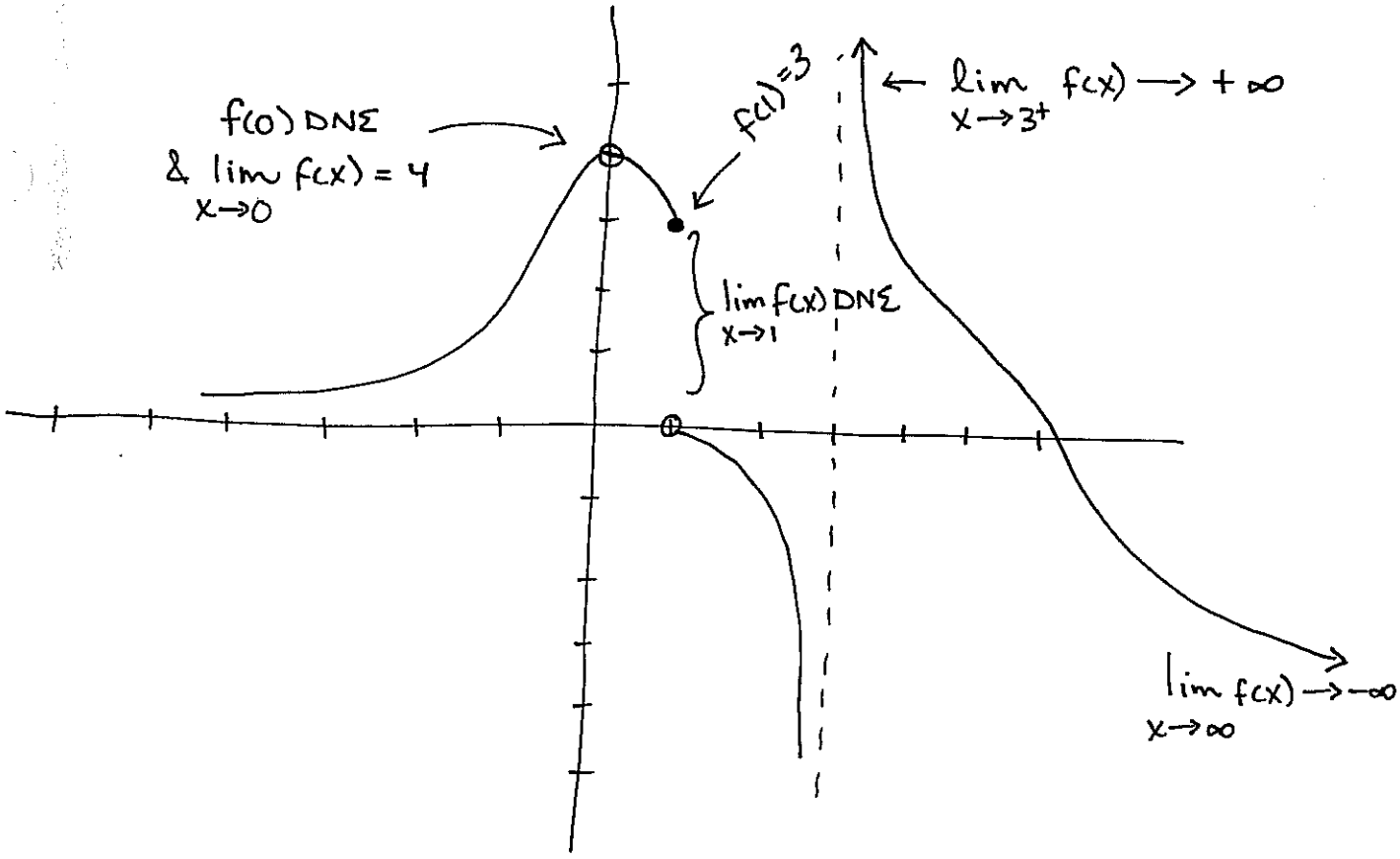
$\lim_{x \to 3^+} f(x) \to \infty$

$f(0)$ DOES NOT EXIST

$f(1) = 3$

$\lim_{x \to 1} f(x)$ DOES NOT EXIST

$\lim_{x \to 0} f(x) = 4$



* NOTE THAT THERE ARE MANY POSSIBLE SOLUTIONS

[QUESTION 4]

(i) $\lim_{x\to 25} \frac{x-25}{5-\sqrt{x}} = \lim_{x\to 25} \frac{(x-25)(5+\sqrt{x})}{(5-\sqrt{x})(5+\sqrt{x})}$

$= \lim_{x\to 25} \frac{(x-25)(5+\sqrt{x})}{25-x} = \lim_{x\to 25} \frac{(x-25)(5+\sqrt{x})}{-(x-25)}$

$= -10$

(ii) $\lim_{x\to 0^+} \frac{x-25}{5-\sqrt{x}} = \frac{-25}{5} = -5$

(iii) $\lim_{x\to 0^-} \frac{x-25}{5-\sqrt{x}}$ DNE (CANNOT APPROACH FROM THE LEFT THIS WOULD GIVE NEGATIVE UNDER SQUARE ROOTS)

VERSION A

[QUESTION 1]

(i) $\lim_{x\to 0} x+3 = 3$

(ii) $\lim_{x\to 1} \frac{x^2-1}{x-1} = \lim_{x\to 1} \frac{(x+1)(x-1)}{(x-1)} = 2$

(iii) $\lim_{x\to 1} \frac{x+2}{x^2+x-2} = \lim_{x\to 1} \frac{x+2}{(x+2)(x-1)} = \lim_{x\to 1} \frac{1}{x-1}$

THERE WILL BE VERTICAL ASYMPTOTES at $x=1$

$\lim_{x\to 1^-} \frac{1}{x-1} \longrightarrow -\infty$

$\lim_{x\to 1^+} \frac{1}{x-1} \longrightarrow +\infty$

[QUESTION 2]

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

$$= 0$$

graph $f(x) = \dfrac{(x^2+3x-4)(x+3)}{(x+4)}$

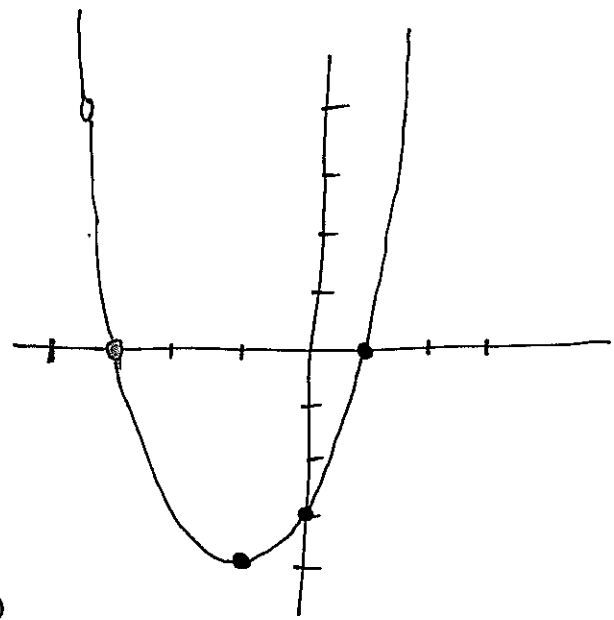
THIS IS THE QUADRATIC $f(x) = x^2+2x-3$ WITH A "HOLLOW DOT" AT $x=-4$

VERTEX : $x = -b/2a = -2/2 = -1$

$y = -4$

x-intercepts $(1,0)$ & $(-3,0)$

y-intercept $(0,-3)$



QUESTION 3]

SEE VERSION B

[QUESTION 4]

(i) $$\lim_{x\to 4} \frac{x-4}{\sqrt{x}-2} = \lim_{x\to 4} \frac{(x-4)}{\sqrt{x}-2}\frac{(\sqrt{x}+2)}{(\sqrt{x}+2)}$$

$$= \lim_{x\to 4} \frac{(x-4)(\sqrt{x}+2)}{(x-4)}$$

$$= 4$$

(ii) $$\lim_{x\to 0^+} \frac{x-4}{\sqrt{x}-2} = \frac{-4}{-2} = 2$$

(iii) $$\lim_{x\to 0^-} \frac{x-4}{\sqrt{x}-2}$$ DNE CANNOT APPROACH FROM THE LEFT THIS WOULD GIVE NEGATIVE UNDER SQUARE ROOT