Date ______________

# CALCULUS-2

Q.4 (a) $\lim_{x\to 10} f(x)$

$\lim_{x\to 10} f(x) = 0$

Limit exists as functional value = limiting value

(b) $\lim_{x\to -2^+} f(x)$

$\lim_{x\to -2^+} f(x) = 3$ $\lim_{x\to -2^+} f(x)$ does not exist

functional val = left limiting val but not continuous hence limit doesn't exist

(c) $\lim_{x\to -8} f(x)$

$\lim_{x\to -8} f(x) = -3$

$\lim_{x\to -8^+} f(x) = -6$ , $\lim_{x\to -8^-} f(x) = -6$

Functional value $\neq$ limiting value
Limit does not exist.

(d) $\lim_{x\to 6} f(x)$

$\lim_{x\to 6^-} f(x) = 2$ $\lim_{x\to 6^+} f(x) =$ ______

$\lim_{x\to 6} = 4.8$

Limit does not exist as functional val $\neq$ limiting val and graph is discontinuous.

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c. $f(-8)$

$f(-8) = -3$

Point Jump discontinuity
$f(-8)$ defined at $(-8, -3)$

f. Vertical Asymptotes

Asymptotes are continuous so limit exists.

Q1. \$ concrete + \$ fencing = \$800

conc = $l \times w \times 8$
$= 8wl$

fence = $4 \times 2 \times l$
$= 8l$

$8wl + 8l = 800$
$8l(w+1) = 800$
$l(w+1) = 100$
~~$w = \frac{100 - l}{l}$~~

$w = \frac{100}{l} - \frac{1}{1} \frac{\times l}{\times l}$

$w = \frac{100 - l}{l}$ Ans.

Mathematically the domain should be all real numbers excluding 0, but as length cannot be negative we may assume $D(0, +\infty)$.

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Q2. Flat fee = \$ 3.00

For every $\frac{1}{4}$ mile = \$0.75 so \$3 for every mile.

$C(x) = 3.00 + 0.75\lfloor 4x \rfloor$

1) (a) $\lim_{x \to 0.30^-} C(x) = 3.75$

(b) $\lim_{x \to 0.30^+} C(x) = 3.75$

(c) $\lim_{x \to 0.30} C(x) = 3.75$

Equal so limit exists

2) (a) $\lim_{x \to 0.45^-} C(x) = 3.75$

(b) $\lim_{x \to 0.45^+} C(x) = 3.75$

(c) $\lim_{x \to 0.45} C(x) = 3.75$

Lim exists

3) (a) $\lim_{x \to 0.75^-} C(x) = 5$

(b) $\lim_{x \to 0.75^+} C(x) = 5$

(c) $\lim_{x \to 0.75} C(x) = 5$

Lim exists.

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Q3.(1) In electric

$MPG(s) = 100 - s$

$MPG'(s) = 0 - 1$

$MPG'(s) = -1$

Gradient constant so no max MPG

In gas

$MPG(s) = \frac{2200}{s}$

$MPG'(s) = -2200s^{-2} = 0$

$-2200 = 0$

No max MPG

(2) $MPG(45) = 100 - 45 = 55$ MPG

$MPG(70) = \frac{2200}{70} = 31.43$

$MPG(60) = \frac{2200}{60} = 36.67$

2. $100 - s = \frac{2200}{s}$

$100s - s^2 = 2200$

$s^2 + 2200 - 100s = 0$

Using calc:

$s1 = 67.82$ $s2 = 32.18$

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Car transitions at approx 67.82 mph

4. The graph will be discontinuous due to domains of the functions and because $\frac{2200}{s}$ has no value at 55 mph but $100-s$ does.

Discontinuity seen at 55 MPG.