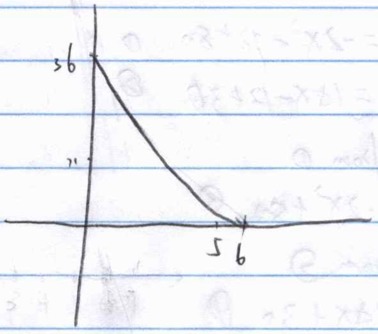
MATH

2.7.1

(a) $p=-x^2+36,\ p=11$



$11=-x^2+36$

$x^2=25$

$x=5$

∴ the quantity demanded is 5000.

(b)

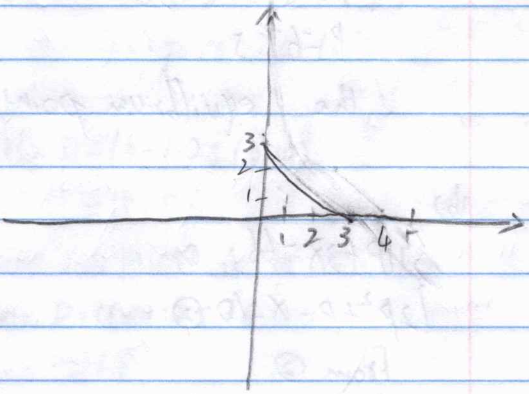
$p=\sqrt{9-x^2}\ ;\ p=2$

$2=\sqrt{9-x^2}$

$4=9-x^2$

$x^2=5$

$x=\sqrt{5}$



∴ the quantity demanded is 2,236.

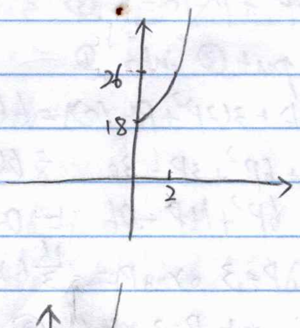
2.7.2

(a) $P=2x^2+18,\ x=2000$.

$P=8+18$

$=26$.

∴ determine the prize is 26.

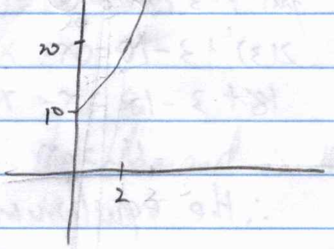


(b) $P=x^3+x+10,\ x=2000$

$P=2^3+2+10$

$=8+2+10$

$=20$



2.7.3.

(a) $\begin{cases} 0=-2x^2-p+80 & ① \\ 0=15x-p+30 & ② \end{cases}$

from ①.

$p=-2x^2+80$ ③

from ②

$p=15x+30$ ④

$\therefore -2x^2+80=15x+30$

$0=2x^2+15x-50$

$0=(2x-5)(x+10)$

$\therefore x_1=2.5,\ x_2=-10$ (round down)

$\therefore p=15\cdot 2.5+30$

$p=67.5$

$\therefore$ the equilbrium point is $(2500, 67.5) \rightarrow (2,5, 67.5)$

b)

$\begin{cases} 11p+3x=66 & ① \\ 2p^2+p-x=10 & ② \end{cases}$

From ②.

$2p^2+p-10=x$ ③

put ③ into ①.

$11p+3(2p^2+p-10)=66$

$11p+6p^2+3p-30=66$

$6p^2+14p-96=0$

$p=3$ or $p=-\frac{16}{3}$ (round down)

put $p=3$ into ②.

$2(3)^2+3-10=x$

$18+3-10=x$

$11=x$

$\therefore$ the equilbrium point is $(11000\ 3) \Rightarrow (11, 3)$

2.7.4

(a) $C(x) = 100,000 + 14x$

(b) $R(x) = 20x$

(c) $P(x) = 20x - 100,000 - 14x$

$= 6x - 100,000$.

d)

$x = 12,000$.

$P(x) = 6x - 100,000$

$= -28,000$.

$x = 20,000$

$P(x) = 6 \cdot 20,000 - 100,000$

$= 20,000$.

2.7.8

$$\begin{cases} P(q) = 144 - q^2 & ① \\ P(q) = 48 + \frac{1}{2}q^2 & ② \end{cases}$$

$\therefore 144 - q^2 = 48 + \frac{1}{2}q^2$

$0 = \frac{3}{2}q^2 - 96$

$0 = 3q^2 - 192$

$0 = q^2 - 64$

$q^2 = 64$

$q = 8$.

put $q = 8$ into ①

$P(q) = 144 - 8^2$

$= 80$.

2.7.9

(a) $P = 16 - 0$.

$= 16$

$\therefore$ price is 16.

(b) $P = 16 - 1.25(0.4)$

$= 15.5$.

$\therefore$ price is 15.5.

(c) $P = 16 - 1.25(0.8)$

$= 15$

$\therefore$ price is 15.

(d) $8 = 16 - 1.25x$

$1.25x = 8$

$x = 6.4$

$\therefore$ the demand is 6400.

(e) $10 = 16 - 1.25x$

$1.25x = 6$

$x = 4.8$

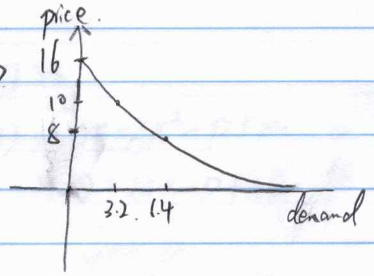
$\therefore$ the demand is 4800.

(f) $12 = 16 - 125x$

$1.25x = 4$

$x = 3.2$ $\therefore$ the demand is 3200.

(g)



(h) $p=0.79q$

When the prise is 0

supply is 0.

(i) $10=0.79q$

$q=12.66$

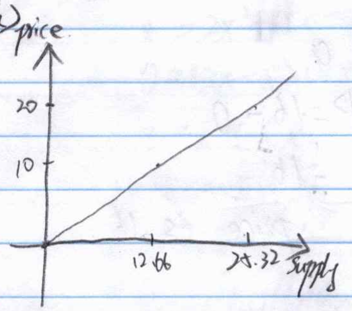
∴ supply is 1266.

(j) $20=0.79q$

$q=25.32$

∴ supply is 2532.

(k)



(l) $\begin{cases} p=16-1.25q & ① \\ p=0.75q & ② \end{cases}$

From ①②

$16-1.25q=0.75q$

$16=2q$

$q=8$

put $q=8$ into ②

$p=0.75\cdot 8$

$=6$

∴ the equilibrium quantity is 8000.

the equilibrium price is 6.

Exercises

3.1.1

$$\lim_{x\to 0}\frac{\sin x}{x}=1$$

3.1.3

$\frac{|x-1|}{1-x^2}$ = $x-1=\pm 0$

$x=\pm 1$

$1-x^2=0$

$(1-x)(1+x)=0$

$x=\pm 1$

$$\lim_{x\to 1^+}\frac{|x-1|}{1-x^2}=0^+$$

$$\lim_{x\to 1^-}=0^-$$

$$\begin{array}{r} x \ \ +24 \\ x-3\,\overline{)\,x^2+x-12} \\ \underline{x^2-3x} \\ +4x \end{array}$$

$(x-2)^2$

$$\begin{array}{r} x-8 \\ x+4\,\overline{)\,x^2-4x+4} \\ \underline{x^2+4x} \\ -8x+4 \end{array}$$

$$\begin{array}{r} x+5 \\ x-2)\,\overline{x^2+x-10} \\ \underline{x^2-4x} \\ 5x-12 \\ \underline{5x-10} \\ ② \end{array}$$

$(x-1)^2$

$x^2\boxed{-2x}+1$

$(x-1)^2+2x$

$x-1+2x$

$3x-1$

$6-1$

3.3.2.

(a) $\lim_{x\to -1} f(x) = -2$

(b) $\lim_{x\to 0^+} f(x) = 2$

(c) $\lim_{x\to 1} f(x) = 2$

(d) $f(1) = 0$

(e) $\lim_{x\to 2} f(x) = 2$

3.4.1

(a) $\lim_{x\to 3} = \frac{x^2+x-12}{x-3} = \frac{(\cancel{x-3})(x+4)}{\cancel{x-3}}$

$= x+4$

$\therefore \lim_{x\to 3} = 7$

(c) $\lim_{x\to -4} \frac{x^2+x-12}{x-3}$ does not have limit because $x \to -4$ can calculate.

$\frac{x^2+x-12}{x-3} = \frac{16-4-12}{-4-3}$

$= 0.$

(d) $\lim_{x\to 2} = \frac{x^2+x-12}{x-2}$

$= \frac{2^2+\cancel{2}-12}{2-2}$

$= \frac{4+2-12}{2-2}$ = Does not exist.

$= \frac{-6}{2-2}$

$= +\infty$

x=2

Verticle asymtotte

V.A.

(f) $\lim_{x\to 0^+} \sqrt{\frac{1}{x}+2} - \sqrt{\frac{1}{x}}$

$= \lim_{x\to 0^+} \frac{\sqrt{\frac{1}{x}+2} - \sqrt{\frac{1}{x}}}{1}$

$= \lim_{x\to 0^+} \frac{(\sqrt{\frac{1}{x}+2} - \sqrt{\frac{1}{x}})(\sqrt{\frac{1}{x}+2} + \sqrt{\frac{1}{x}})}{1(\sqrt{\frac{1}{x}+2} + \sqrt{\frac{1}{x}})}$

$= \lim_{x\to 0^+} \frac{2}{\sqrt{\frac{1}{x}+2} + \sqrt{\frac{1}{x}}}$

$= \frac{2}{+\infty}$

$= 0$

(b) $\lim_{x\to 1} \frac{x^2+x-12}{x-3}$ does not have limit because $x \to 1$ can calculate.

$\frac{x^2+x-12}{x-3}$

$= \frac{1+1-12}{-2}$

$= \frac{-10}{-2} = 8$

(c) $\lim_{x\to 1} \frac{\sqrt{x+8} - 3}{x-1}$

$= \frac{(\sqrt{x+8}-3)(\sqrt{x+8}+3)}{(x-1)(\sqrt{x+8}+3)}$

$= \frac{(x+8)-9}{(x-1)(\sqrt{x+8}+3)}$

$= \frac{\cancel{x-1}}{\cancel{(x-1)}(\sqrt{x+8}+3)}$

$= \frac{1}{\sqrt{x+8}+3}$

$= \frac{1}{6}$

(g) $\lim_{x\to 2} 3$ does not have limit because 3 is a general number.

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$\frac{4-5}{0}$ $2-1$ $\frac{1}{2}$

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

$= +\infty$

(h) $\lim_{x\to 4} 3x^3-5x$

It doesn't have limit 4 can be caculate.

(l) $\lim_{x\to 0^+} \frac{\sqrt{2-x^2}}{x+1}$

$= \frac{\sqrt{2}}{1}$ Not exist.

$= \sqrt{2}$.

(i) $\lim_{x\to 0} \frac{4x-5x^2}{x-1}$

$= \frac{0}{-1}$

$= 0$

(m) $\lim_{x\to a} \frac{x^3-a^3}{x-a}$

$= \lim_{x\to a} \frac{\cancel{(x-a)}(x^2+ax+a^2)}{\cancel{x-a}}$

$= x^2+ax+a^2$

$= a^2+a^2+a^2$

$= 3a^2$

(j) $\lim_{x\to 1} \frac{x^2-1}{x-1}$

$= \frac{\cancel{(x-1)}(x+1)}{\cancel{x-1}}$

$= 2$

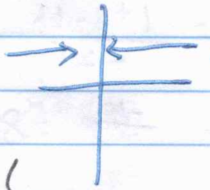
$($ $x-a$ $\frac{x^2}{\sqrt{x^3-a^3}}$

$(x+a)^2(\cancel{x}-a)$

(n) $\lim_{x\to 2} (x^2+4)^3$

It doesn't have limit It can calculate.

$(2^2+4)^3$



$M = \lim_{x\to L} f(x)$

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

$M = 1$

3.4.2

$\lim_{x\to 0} g(x) = L$

$\because g(x) = 0$.

$\therefore L = 0$

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

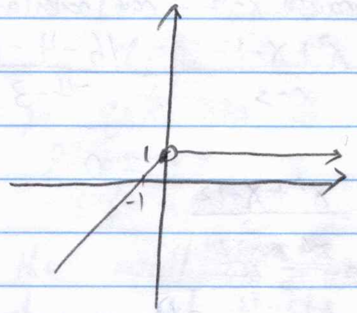
True.

$\lim_{x\to 0} (x) = 1$

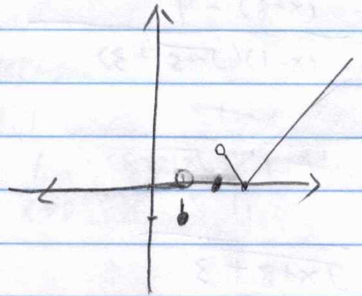
$\lim_{x\to 0} f(0) = M$.

3.4.3

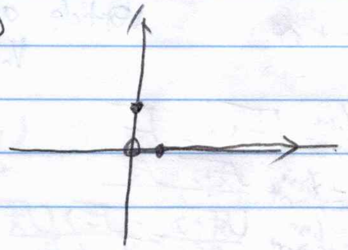
(a)



(b)



(c)



3.4.4.

(a) $\lim_{x\to a} p(x) - \lim_{x\to a} q(x) = -1$

(b) $\lim_{x\to a} \sqrt{q(x)} = 2$.

(c) $\lim_{x\to a} \left[\frac{2p(x)-q(x)}{p(x)q(x)}\right] = \frac{\lim_{x\to a} 2p(x)-q(x)}{\lim_{x\to a} p(x)q(x)} = \frac{6-4}{12} = \frac{1}{6}$