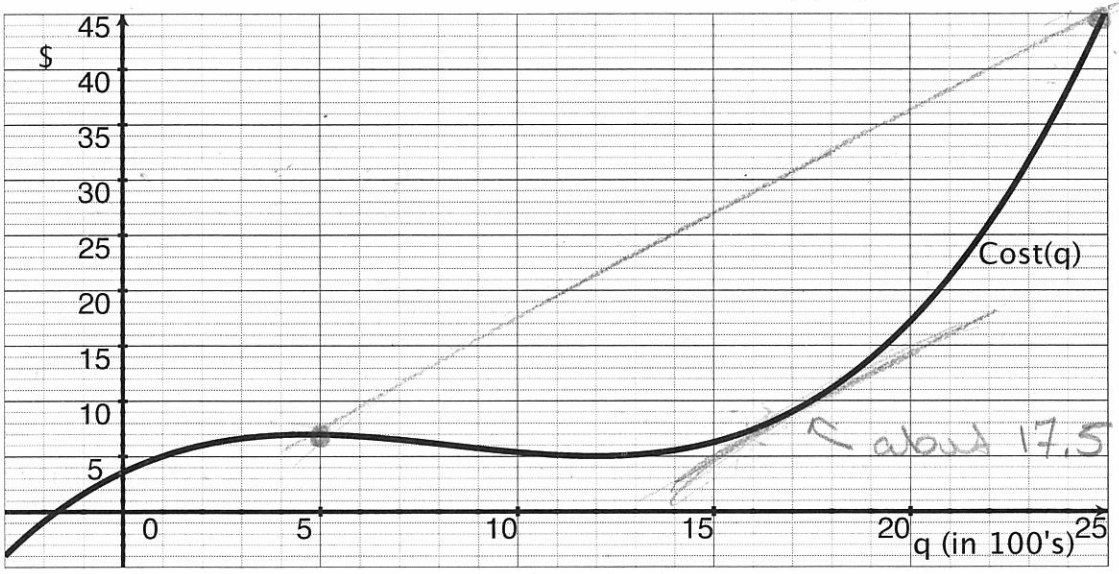
Key

TMATH 124: Quiz 6

You may use any work of yours that you made from last week. This includes, practice book problems and worked out WebAssign problems. This *does not* include photocopies of notes from the book or tutorials shown on WebAssign. Graphing calculators are also not allowed. In short, you are only allowed to use *work* that you created.

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. No credit is given without supporting work.

1. [1] Use the graph of the Cost function below to *estimate* the value of c that satisfies the conclusion of the Mean Value Theorem for the interval $[5, 25]$.



2. [4] Find the limit of each of the following:

$$\lim_{x\to\infty} x\sin\left(\frac{5\pi}{x}\right)$$

alg +.5

$= \lim_{x\to\infty} \frac{\sin\left(\frac{5\pi}{x}\right)}{\frac{1}{x}}$ "0/0"

L'H +.5 $= \lim_{x\to\infty} \frac{\cos\left(\frac{5\pi}{x}\right)\cdot\frac{-5\pi}{x^2}}{\frac{-1}{x^2}}$ der +.5 der +.5

$= \lim_{x\to\infty} \cos\left(\frac{5\pi}{x}\right)\frac{-5\pi}{x^2} \div \frac{-1}{x^2}$

$= \lim_{x\to\infty} 5\pi\cos\left(\frac{5\pi}{x}\right)$ → 1

$= 5\pi$

got the alg trick right +.5

$$\lim_{x\to 5} \frac{x^2+x-30}{x-5}$$

$= \lim_{x\to 5} \frac{(x+6)(x-5)}{x-5}$

$= \lim_{x\to 5} (x+6) = 5+6 = 11$

factored +.5
alg +.5
got it +.5

— or —

L'H +.5
der top +.5
der bottom +.5
got it +.5

3. Assume the relationship between price (p) and quantity demanded (q) is *linear*. Market research shows that 10,000 items are sold when the price is \$5, and 12,900 items are sold when the price is \$4.50.

(a) [2] Find the revenue function that result from selling q items for \$p as *only* a function of q.

looking for $p = mq + b$ (+.5)

p & q in correct spots

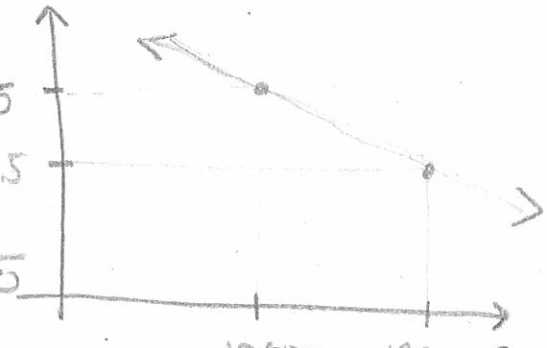
(+.5) slope $= \frac{5 - 4.5}{10000 - 12900} = \frac{.5}{-2900} = \frac{-1}{5800}$

passes thru $(10000, 5)$ so

(+.5) $5 = -\left(\frac{1}{5800}\right)10{,}000 + b$

$\Rightarrow b = 5 + \frac{10000}{5800}$

$= 5 + \frac{50}{29} = \frac{195}{29}$



(+.5) $Rev = P \cdot q = \left(\frac{-1}{5800}q + \frac{195}{29}\right)q$

thus

$P = \frac{-1}{5800}q + \frac{195}{29}$

$\approx .0001724\,q + 6.724$

(b) [3] Use calculus to find the price and quantity that will maximize revenue.

Revenue $= P \cdot q$ (+.5) correct function

$= \left(\frac{-1}{5800}q + \frac{195}{29}\right)q$

$= \frac{-1}{5800}q^2 + \frac{195}{29}q$

Revenue' $= \frac{-1}{2900}q + \frac{195}{29}$ (+.5) deriv.

To find the critical points

(+.5) $0 = \text{Revenue}'$

$0 = \frac{-1}{2900}q + \frac{195}{29}$

$\frac{195}{29} = \frac{1}{2900}q$

$q = \frac{195 \cdot 2900}{29} = 19{,}500$

adq (+.5)

Rev'(0) + 19500 Rev'(20,000) −

MAX (+.5)

when $q = 19{,}500$ and

price $= \frac{-1}{5800}(19500) + \frac{195}{29}$

answered ? (+.5) or \$3.36