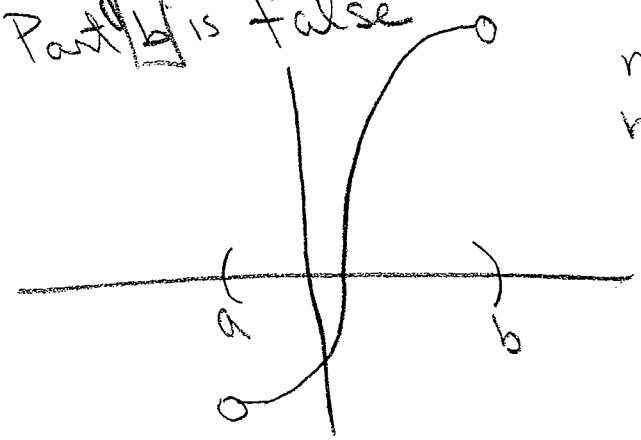
Test 2: Answer Key

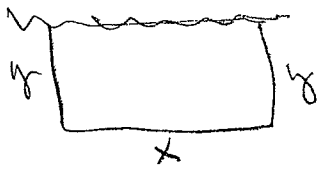
1. a) T
   b) F
   c) T
   d) F
   e) F

f) Part b is false



no abs max or min

2.



$A = xy$ $\quad A = 180{,}000$ sq.m.

$\frac{180{,}000}{y} = x$

$P = 2y + x$

$P = 2y + 180{,}000\, y^{-1}$

$P' = 2 - 180{,}000\, y^{-2} \Rightarrow CP \quad 2 = \frac{180{,}000}{y^2}$

$y^2 = 90{,}000$

$y = 300$ m.

$P'' = \frac{360{,}000}{y^3} > 0 \Rightarrow \cup \Rightarrow$ MIN

$x = \frac{180{,}000}{300} = 600$ m

Dim: 300 m x 600 m = w x l

3a $x^2(x-y)^2 = x^2 - y^2$

$2x(x-y)^2 + x^2\, 2(x-y)^1\left(1 - \frac{dy}{dx}\right) = 2x - 2y\frac{dy}{dx}$

$2x(x-y)^2 + 2x^2\left(x - x\frac{dy}{dx} - y + y\frac{dy}{dx}\right) = 2x - 2y\frac{dy}{dx}$

$x(x-y)^2 + x^3 - x^3\frac{dy}{dx} - x^2y + x^2y\frac{dy}{dx} = x - y\frac{dy}{dx}$

$\left(y + x^2y - x^3\right)\frac{dy}{dx} = x - 2x^3 + x^2y - xy^2$

$\frac{dy}{dx} = \frac{x + 2x^2y - 2x^3 - xy^2}{y + x^2y - x^3}$

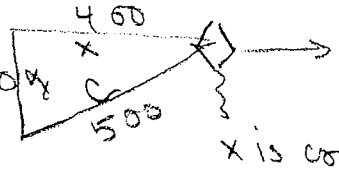
3b $x = 1, y = 1 \quad x^2(x-y)^2 = x^2 - y^2$

check: $1(1-1)^2 \stackrel{?}{=} 1^2 - 1^2 \Rightarrow 0 = 0$ ✓

3c) $y'(1,1) = \frac{1+1-1}{1+1-1} = \frac{1}{1} = \boxed{1}$

3d) $y-1 = m_T(x-1)$

$y-1 = 1(x-1) \Rightarrow y-1 = x-1 \Rightarrow \boxed{y=x}$

4. 

x is constant

$x^2 + y^2 = c^2$

$300^2 + x^2 = c^2$

$\frac{x}{c}\frac{dx}{dt} = \frac{dc}{dt}$

$0 + 2x\frac{dx}{dt} = 2c\frac{dc}{dt}$

$\frac{400}{500}\frac{25}{1} = \frac{dc}{dt} = \boxed{20 \text{ ft/sec}}$

5a) $y = \frac{(x+7)(x-7)}{(x+7)(x-2)} = \frac{x-7}{x-2}$ $x \neq -7$

HA: $\boxed{y=1}$ $\lim_{x\to\infty} \frac{x-7}{x-2} \overset{DOP}{=} 1$

VA: $\boxed{x=2}$ $\lim_{x\to 2^+} \frac{x-7}{x-2} = \frac{-5}{+0} = -\infty$

$\lim_{x\to 2^-} \frac{x-7}{x-2} = \frac{-5}{-0} = +\infty$

OA: $\boxed{\text{none}}$ the numerator is <u>not</u> one degree higher than the denominator.

b) $x-2 \overline{)\, x-7}$ $\quad 1 + \frac{-5}{x-2}$

$\frac{x-2}{-5}$

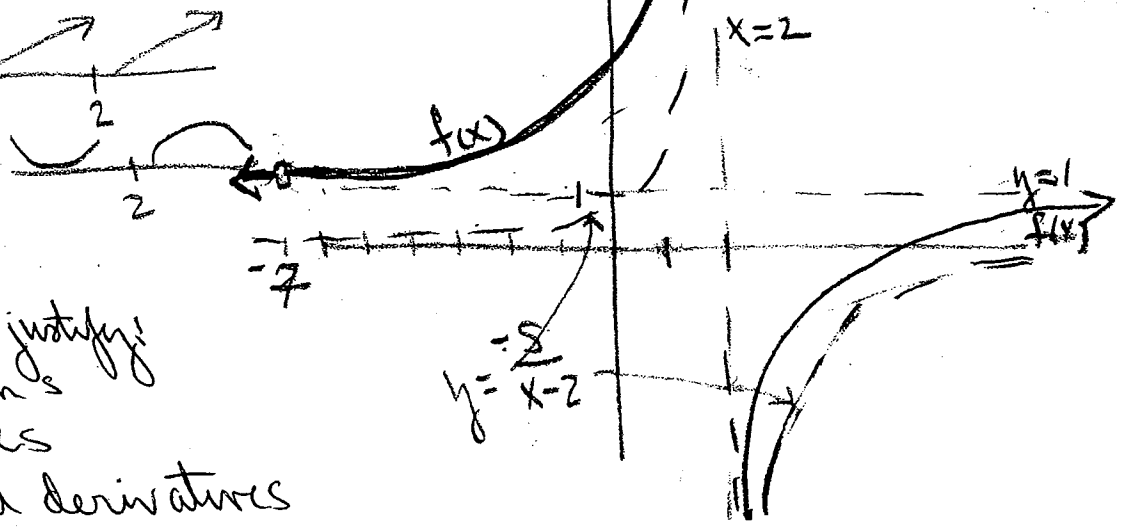
1 is dom as $x \to \infty$

$\frac{-5}{x-2}$ is dom as $x \to 2$

$\boxed{y = 1 - \frac{5}{x-2}}$

$y' = \frac{5}{(x-2)^2}$

$y'' = \frac{-10}{(x-2)^3}$



three ways to justify:

① dom. terms

② asymptotes

③ 1st & 2nd derivatives