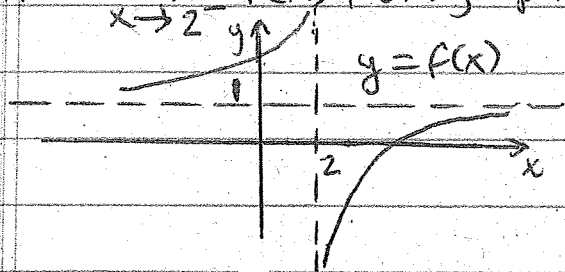


(10) (1a) $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x - 2}$

Hint: $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

b) $\lim_{x \rightarrow -\infty} \frac{3x^2 + 4x}{2x^4 + 3x - 8}$

(10) (2) Find $\lim_{x \rightarrow 2} f(x)$ from graph.



b) IF $f(x) = \frac{x + 3}{x^2 - x - 2}$,

where is f not continuous?

(10) (3) Find the derivative of $y = f(x) = 3x^2 - 4x$ using the definition of derivative.

(the one with "h")

(5) (4) IF $P(x) = -400x^2 + 6800x + 1200$

Find the value of x which gives the maximum profit.

(Use Calculus.)

(10) (5a) Find the equation of the tangent line to $y = 2x^3 - 3x^2 + 2x - 4$ at $x = 1$.

b) Find y' using Product Rule

IF $y = (x^3 - 3x + 5)(2x^2 + 5x)$

(5) (6) IF $y = \frac{x - 3}{x + 1}$, find y''

Hint: Simplify y' .

(25) (7a) IF $y = u^4 - 2u + 5$,
 $u = 3x^{-2} - x^{-4}$, find $\frac{dy}{dx}$ in terms of x .

b) Find y' if $y = x^3(2x^2 + 1)^2$ without Product Rule or Quotient Rule.

c) IF $y = \frac{1}{(3x^2 - 7)^4}$ find

y' without Quotient Rule or Product Rule.

d) IF $y = f(x) = (1 - 3x^2)^5$ find the slope of the tangent line at $x = 1$.

Hint: First find $f'(x)$.

e) Demand for coffee is $D(p) = 4374p^{-2}$ pounds when the price is p dollars.

From now the price will be $p(t) = 0.02t^2 + 0.1t + 6$ dollars per pound.

At what rate will the demand for coffee be changing with respect to time 9 weeks from now?

MAC 2233 EXAM I KEY (SU'16)

① a) $\lim_{x \rightarrow 2} \frac{(x-2)(x^2+2x+4)}{(x-2)(4+4+4)} = \frac{0}{0}$

b) 0 (since degree of numerator < deg. of denominator)

② a) ∞

b) $x^2 - x - 2 = (x-2)(x+1) = 0$
 $x = 2, -1$

③ $\frac{f(x+h) - f(x)}{h} =$

$\frac{3(x+h)^2 - 4(x+h) - (3x^2 - 4x)}{h} =$

$\frac{3x^2 + 6xh + 3h^2 - 4x - 4h - 3x^2 + 4x}{h} =$

$\frac{6xh + 3h^2 - 4h}{h} =$
 $6x + 3h - 4$

Let $h \rightarrow 0$, $f'(x) = 6x - 4$

④ $p'(x) = -800x + 6800 = 0$

$800x = 6800$

$x = 8.5$

⑤ a) $y' = 6x^2 - 6x + 2 = f'(x)$

$f'(1) = 2$

$(1, -3)$

$y + 3 = 2(x - 1)$ or $y = 2x - 5$

b) $(x^3 - 3x + 5)(4x + 5) +$

$(2x^2 + 5x)(3x^2 - 3)$

⑥ $y' = \frac{(x+1)(1) - (x-3)(1)}{(x+1)^2} = \frac{4}{(x+1)^2}$

$= 4(x+1)^{-2}$

$y'' = -8(x+1)^{-3}$

⑦ a) $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

$= (4u^3 - 2)(-6x^{-3} + 4x^{-5})$

$= (4(3x^{-2} - x^{-4})^3 - 2)(-6x^{-3} + 4x^{-5})$

b) $y = x^3(4x^4 + 4x^2 + 1)$

$= 4x^7 + 4x^5 + x^3$

$y' = 28x^6 + 20x^4 + 3x^2$

c) $y = (3x^2 - 7)^{-4}$

$y' = -4(3x^2 - 7)^{-5} (6x)$ ← c.r.

d) $f'(x) = 5(1 - 3x^2)^4 (-6x)$ ← c.r.

$f'(1) = 5(1 - 3)^4 (-6)$

$= 5(16)(-6) = -480$

e) $\frac{dD}{dt} = \frac{dD}{dp} \cdot \frac{dp}{dt}$, $t = 9 \Rightarrow$
 $p = 8.52$

$= (-8748p^{-3})(.04t + 0.1)$

$= \frac{-8748}{(8.52)^3} (.04(9) + 0.1)$

$= -6.5065$