First + mid
Math 141

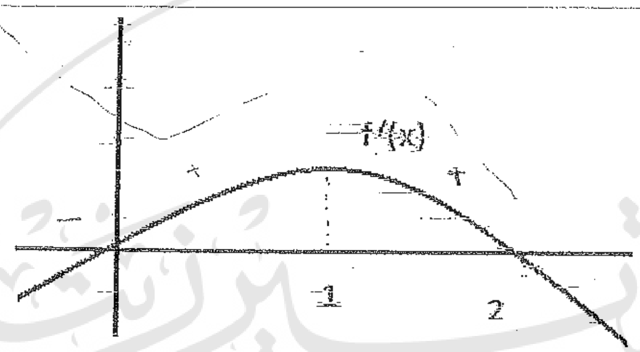
Key

جامعة بيرزيت
BIRZEIT UNIVERSITY
MATH. DEPARTMENT Summer Semester 2012/2013

Student Name (Arabic) : ______________________ ID : __________
Section : ______________________ Short Exam(3) MATH141

Q1) Consider the following graph of $f'(x)$ on $(-\infty, \infty)$.

5



Answer question 1-7 below

1) The critical point(s) of f is/are $x=0$, $x=2$

2) f increasing on $[0,2]$ and decreasing on $(-\infty,0] \cup [2,\infty)$

3) f has a local minimum at x= 0 and a local maximum at x= 2

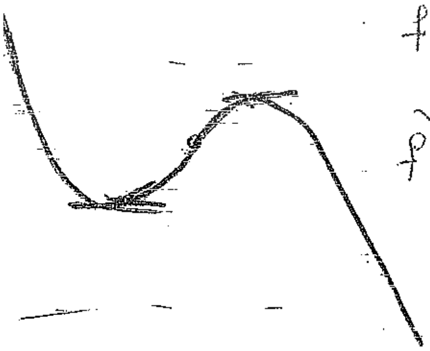
4) f is concave up on $(-\infty,1]$ and concave down on $[1,\infty)$

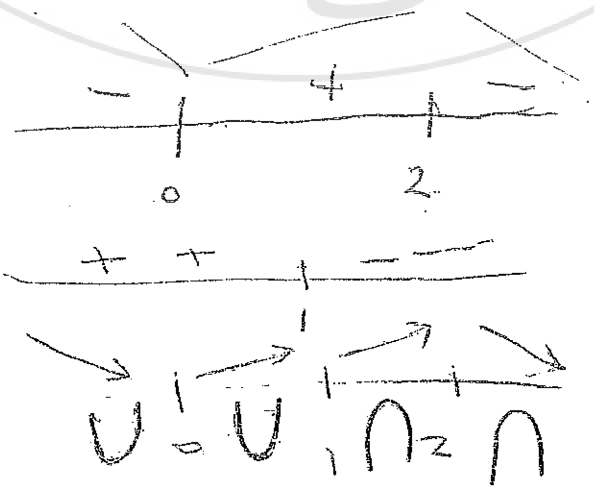
5) Are they absolute extreme values
a) Yes b) No

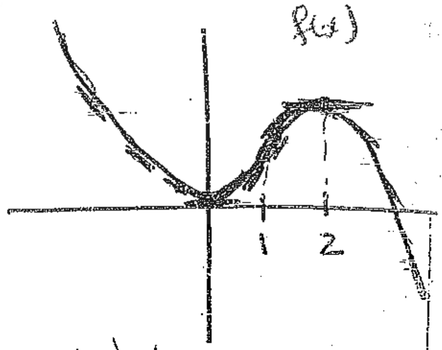
$f'(c)=0$
$f''(c)>0$

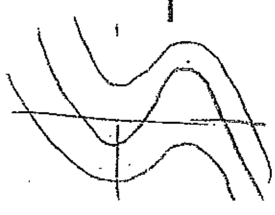
6) f has inflection point at x= 1

7) Graph the function









Q(2) Solve the following questions then circle the correct answer.

(1) Applying the mean value theorem to the function $f(x) = x^{\frac{3}{4}}$ on the interval $[0,1]$ we get

a) $c = \left(\frac{3}{4}\right)^{4}$

b) $c = \left(\frac{4}{3}\right)^{4}$

c) $c = 1$

d) We cannot apply the mean value theorem.

(2) The function $y = tanx - cotx - x, \ \ on \ \ (0, \frac{\pi}{2})$

(a) Has no zero.

(b) Has more than one zero.

(c) Has exactly one zero.

(d) Has exactly two zero.

(3) $\lim_{x\to 0} \frac{\pi^{sinx}-1}{e^{x}-1}$

a) $ln\pi$

b) 1

c) 0

d) ∞

a c a b

(4) $\lim_{x\to 0^+}(sinx)(lnx)$

a) 1

b) 0

c) ∞

d) Does not exist.

(5) One of the following is always true

a) If f has a local maximum at $x = c$ then $f'(c) = 0$.

b) If f has an inflection point $(c, f(c))$ then $f''(c) = 0$.

c) If $f'(c) = 0$ then f has a local max. or local min. at $x = c$.

d) If f is continuous on a closed interval then f has both absolute maximum and absolute minimum.

(6) The absolute max. of $f(x) = \frac{1}{x^2 - 2x + 5}$ $on\ [0,4]\ is$

a) 1/5

b) ¼

c) 2/5

d) 1/13

d b d

(7) Suppose the radius of a sphere increases from 10 to 10.1 cm. The approximate change in the surface area of the sphere is

a) 2π

b) 4π

c) 6π

d) 8π

(8) $\lim_{x \to 0^+} \sqrt{x}\, e^{\cos\left(\frac{\pi}{x}\right)} =$

$\lim_{x \to 0^+} \frac{e^{\cos\left(\frac{\pi}{x}\right)}}{\frac{1}{\sqrt{x}}}$ $\left(\frac{\infty}{\infty}\right)$

$\frac{e^{\cos\frac{\pi}{x}} \cdot \left(-\sin\frac{\pi}{x}\right)\left(\frac{-\pi}{x^2}\right)}{-\frac{1}{2} x^{-3/2}}$

a) π

b) $-\pi$

c) 0

d) Does not exist.

$\sqrt{x}\, e^{-1} \le \left(e^{\cos\frac{\pi}{x}}\right)^{\sqrt{x}} \le e\sqrt{x}$

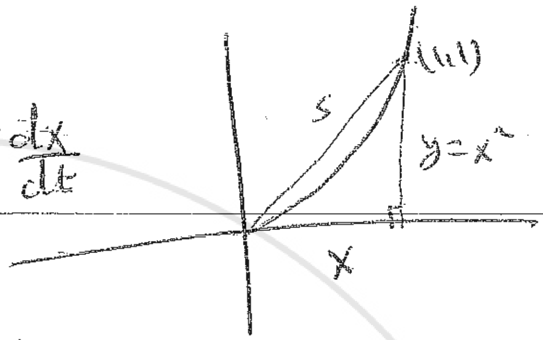
$\downarrow$ 0 $\quad \downarrow$ 0 $\quad \downarrow$

3

Q4 : A particle moves on the parabola $y = x^2$ in the first quadrant. Its distance from the origin increases at the rate of 1 cm/min. Find the rate at which its x-coordinate changes when it is at the point (1,1).

$$s^2 = x^2 + x^4$$

$$2s\frac{ds}{dt} = 2\frac{dx}{dt} + 4x^3\frac{dx}{dt}$$



at (1,1), $s = \sqrt{2}$

$$\Rightarrow \sqrt{2}\frac{ds}{dt} = \frac{dx}{dt} + 2\frac{dx}{dt}$$

$$\Rightarrow \frac{dx}{dt} = \frac{\sqrt{2}}{3} \text{ cm/min.}$$

Good Luck