Math 241 Summer 2019 Professor MG
Recitation Worksheet 3 Name: _____

1 Topics after Midterm 1 but before Midterm 2

(1) At time t, the position of a body moving along the s-axis is $s = t^3 - 6t^2 + 9t$ m.

(a) Find the body's acceleration each time the velocity is zero.

(b) Find the body's speed each time the acceleration is zero.

(c) Find the total distance traveled by the body from $t = 0$ to $t = 2$.

(2) The radius r and height h of a right circular cylinder are related to the cylinder's volume V by the formula $V = \pi r^2 h$.

(a) How is dV/dt related to dh/dt if r is constant?

(b) How is dV/dt related to dr/dt if h is constant?

(c) How is dV/dt related to dr/dt and dh/dt if neither r nor h is constant?

(3) A man 6ft tall walks at the rate of 5 ft/sec towards a streetlight that is 16 ft above the ground. At what rate is the tip of his shadow moving? At what rate is the length of his shadow changing when he is 10ft from the base of the light?

(4) (a) Find the linearization $L(x)$ of $f(x)$ at $x = a$: $f(x) = x^3 - 2x + 3$, $a = 2$

(b) Find the linearization $L(x)$ of $f(x)$ at $x = a$: $f(x) = \tan x$, $a = \pi$

(5) Find dy of $y = x^3 - 3\sqrt{x}$

(6) Find the absolute minimum and maximum values of each function on the given interval.

(a) $f(x) = x^2 - 1$, $-1 \le x \le 2$

(b) $f(\theta) = \sin\theta$, $-\dfrac{\pi}{2} \le \theta \le \dfrac{5\pi}{6}$

(7) Show that $f(x) = x^3 + \dfrac{4}{x^2} + 7$ has exactly one zero in $(-\infty, 0)$

(8) Find the value or values c that satisfy the conclusion of the Mean Value Theorem:

$$f(x) = \sqrt{x-1},\ [1,3]$$

(9) Answer the following questions about the function whose derivative is given by $f'(x) = (x - 7)(x + 1)(x + 5)$:

(a) What are the critical points of f?

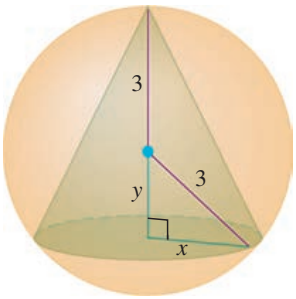
(b) On what intervals is f increasing or decreasing?

(c) At what points, if any, does f assume local maximum and minimum values?

(10) Graph $y = 6 - 2x - x^2$. Include the coordinates of any local extreme points and inflection points.

(11) A 216 m^2 rectangular pea patch is to be enclosed by a fence and divided into two equal parts by another fence parallel to the one of the sides. What dimensions for the outer rectangle will require the smallest total length of fence? How much fence will be needed?

(12) Find the volume of the largest right circular cone that can be inscribed in a sphere of radius 3.



(13) Use Newton's method to estimate the solutions of the equation $x^2 + x - 1 = 0$. Start with $x_0 = -1$ for the left-hand solution and with $x_0 = 1$ for the solution on the right. Then, in each case, find x_2.

2 Topics after Midterm 2

(1) Evaluate the following integrals:

(a) $\displaystyle\int \left(\frac{\sqrt{x}}{2} + \frac{2}{\sqrt{x}}\right) dx$

(b) $\displaystyle\int x^{-3}(x+1)\, dx$

(c) $\displaystyle\int_0^1 (x^2 + \sqrt{x})\, dx$

(d) $\displaystyle\int_0^{\pi/3} 2\sec^2 x\, dx$

(e) $\displaystyle\int \frac{1}{\sqrt{x}(1+\sqrt{x})^2}\, dx$

(f) $\displaystyle\int \frac{\sin(2t+1)}{\cos^2(2t+1)}\, dt$

(g) $\displaystyle\int_0^1 (4y - y^2 + 4y^3 + 1)^{-2/3}(12y^2 - 2y + 4)\, dy$

(h) $\displaystyle\int_{-\pi/4}^0 \tan x \sec^2 x\, dx$

(2) Find the derivative by

(a) by evaluating the integral and differentiating the result.

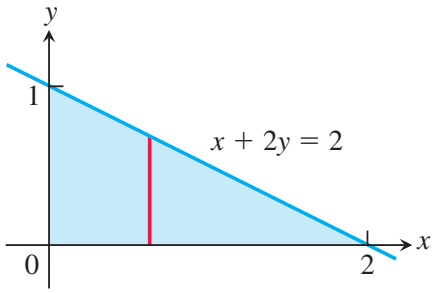
(b) by differentiating the integral directly

$$\frac{d}{dx}\int_0^{\sqrt{x}} \cos t\, dt$$

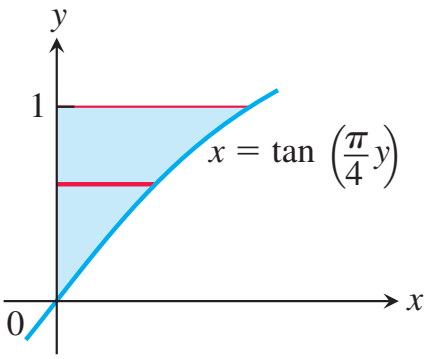
(3) Set up but do not evaluate the integral(s) needed to find the areas of the regions enclosed by the curves: $y = x^4 - 4x^2 + 4$ and $y = x^2$

(4) The solid lies between planes perpendicular to the x-axis at $x = -1$ and $x = 1$. The cross-sections perpendicular to the x-axis are circular disks whose diameters run from the parabola $y = x^2$ to the parabola $y = 2 - x^2$.

(5) Find the volume of the solid generated by revolving the shaded region about the x-axis.



(6) Find the volume of the solid generated by revolving the shaded region about the y-axis.



(7) Find the volume of the solid generated by revolving the region the region bounded by $y = \sqrt{x}$ and the lines $y = 2$ and $x = 0$ about

(a) the x-axis

(b) the y-axis