編號： 263

國立成功大學 107 學年度碩士班招生考試試題

系　　所：企業管理學系

考試科目：微積分

考試日期：0206，節次：3

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Park A: Multiple-Choice Questions (50 points, 5 points each)

1. [5 points] Find the values of *A* and *B* that make the limit, $\lim_{x\to 3}\frac{A\sqrt{x+6}+B}{x-3}=2$, exist.

   (a) $A=12, B=-36$

   (b) $A=11, B=-33$

   (c) $A=13, B=-39$

   (d) $A=14, B=-42$

2. [5 points] Evaluate $\lim_{x\to -1}\frac{\sum_{i=0}^{99}x^i}{x+1}=$ _____

   (a) 49

   (b) 50

   (c) ∞

   (d) 48

3. [5 points] Find the radius of convergence of the series $\sum_{n=0}^{\infty}\frac{(-1)^n}{n^2\cdot 3^n}(x+3)^n$.

   (a) 1

   (b) 2

   (c) 3

   (d) ∞

4. [5 points] For what values of A and B does the function $f(x)=x^3+Ax^2+Bx-2$ have maximum and minimum values at $x=-2$ and 1, respectively.

   (a) $A=1, B=2$

   (b) $A=\frac{3}{2}, B=4$

   (c) $A=3, B=-5$

   (d) $A=\frac{3}{2}, B=-6$

5. [5 points] Find the shortest distance from the circle $x^2+(y-2)^2=1$ to the line $y=x$.

   (a) $\sqrt{2}-1$

   (b) $\sqrt{2}$

   (c) 2

   (d) 1

6. [5 points] Find the volume of the solid obtained by rotating $x^2+(y-2)^2\le 1$ about the line $y=x$.
   (a) $\sqrt{2}\pi^2$
   (b) $2\sqrt{2}\pi^2$
   (c) $2\pi^2$
   (d) $3\sqrt{2}\pi^2$

7. [5 points] Calculate $\int_1^2 \frac{2x+1}{x^3+2x^2+x}dx=$_____
   (a) $\frac{1}{3}+2\ln(2)-\ln(3)$
   (b) $\frac{1}{4}+\ln(2)-\ln(3)$
   (c) $\frac{1}{6}-\ln(3)$
   (d) $\frac{1}{6}+2\ln(2)-\ln(3)$

8. [5 points] Find the vertical and horizontal asymptotes of the function $f(x)=\frac{\cos x}{(x-\pi/2)(x-\pi)}$.
   (a) $x=\pi$, $y=1$
   (b) $x=0$, $y=0$
   (c) $x=\pi$, $y=0$
   (d) $x=0$, $y=1$

9. [5 points] Calculate $\int_0^3\int_1^2 \frac{x^2}{y}dydx=$_____
   (a) $9\ln 2$
   (b) $\frac{1}{2}\ln 2$
   (c) $e^2\cdot 3$
   (d) $\ln\frac{3}{2}$

10. [5 points] Calculate $\int_0^{\frac{\pi}{2}} e^{2\cos x}\sin x dx=$_____
    (a) 0
    (b) $\frac{1}{2}e^2$
    (c) $\frac{-1}{2}+\frac{1}{2}e^2$
    (d) e

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Park B: Please simplify your answers as possible as you can. (50 points)

1. A company determines its demand function for a product by $p = 21 - x$, where p is the price per unit(in dollars) and x is the number of units, and its cost(in dollars) of producing x units by $C = x + 20$.

   (a) [3 points] Find the profit function P.

   (b) [2 points] Compute the marginal profit function dP/dx.

   (c) [5 points] What price will yield a maximal profit ?

2. Let

$$\sin(y/x) = \ln\sqrt{x^2 + y^2} \tag{1}$$

   be a relation between two variables x and y.

   (a) [5 points] Use implicit differentiation to determine dy/dx.

   (b) [5 points] Find an equation of the tangent line to the curve given by Eq. (1) at the point (1,0).

3. (a) [5 points] Calculate $\lim_{n\to\infty} a_n$, where $\{a_n\}$ is a sequence defined by

$$a_n = \cos^2(\pi\sqrt{n^{200} + n^{100}}), \qquad n \geq 1.$$

   (b) [5 points] Evaluate $\int_0^1 x\sqrt{1-x}\,dx$.

4. (a) [5 points] Show that $\sum_{n=0}^{\infty} \frac{(-1)^n \cdot x^n}{n!}$ converges for all x.

   (b) [5 points] Show that $\sum_{n=1}^{\infty} \frac{(-1)^n}{2n^{\frac{1}{3}} + 2}$ is not absolutely convergent.

5. Company NCKU determines that its price-demand function for a product can be modeled by

$$p = 100 - 4\sqrt{x}, \qquad 0 \leq x \leq 625.$$

   (a) [5 points] Show that the price elasticity of demand is elastic if $x = 225$.

   (b) [5 points] Find the values of x and p that maximize the total revenue.

Reference

1. **Ron Larson, Calculus: An Applied Approach, 10e, Metric Version.**
2. **James Steward, Essential Calculus: Early Transcendentals, 2e, Metric Version.**
3. **Ron Larson and Tzuwei Cheng, Calculus: An Applied Approach, 2014.**
4. **Bill Armstrong and Don Davis, Brief Calculus for the Business, Social, and Life Sciences, 2014.**