國立雲林科技大學
100學年度碩士班暨碩士在職專班招生考試試題

系所：工管所、運籌所
科目：微積分(2)

選擇題共20題，每題5分

1. A rectangle has perimeter 18 m. Express the area of the rectangle as a function $A(l)$ of the length l of one of its sides.

(a) $A(l)=18l+l^2$

(b) $A(l)=18l-l^2$

(c) $A(l)=9l+l^2$

(d) $A(l)=9l-l^2$

2. Find a number δ such that $\left|\sqrt{4x+1}-3\right|<0.4$ where $|x-2|<\delta$. Please give the answer correct to two decimal places, rounding **down** if necessary.

(a) 0.56

(b) 0.71

(c) 0.64

(d) 0.79

3. Determine the values of x for which the linear approximation $\frac{1}{(1+3x)^3}\approx 1-9x$ is accurate to within 0.15.

(a) $-0.65<x<0.66$

(b) $-1.03<x<0.24$

(c) $-0.57<x<0.68$

(d) $-0.04<x<0.06$

4. Two cars start moving from the same point. One travels south at 28 mi/h and the other travels west at 50 mi/h. At what rate is the distance between the cars increasing 4 hours later? Round the result to the nearest hundredth.

(a) 57.31 mi/h

(b) 55.31 mi/h

(c) 58.32 mi/h

(d) 57.34 mi/h

5. Use implicit differentiation to find an equation of the tangent line to the curve $y^2=x^3(10-x^2)$ at the point (1, 3).

(a) $y=3.33x$

(b) $y=4.33x$ - 1.33

(c) $y=5.33x$ -2.33

(d) $y=6.33x$ - 3.33

6. Use Newton's method to approximate the root of $x^4 + x - 3 = 0$ in the interval [1, 2], correct to six decimal places. Use $x_1 = 1.5$ as the initial approximation.

(a) $x = 1.164036$
(b) $x = 1.164032$
(c) $x = 1.164033$
(d) $x = 1.164035$

7. For the given cost and demand functions, find the production level that will maximize profit.

$$C(x) = 680 + 11x + 0.04x^2, \quad p(x) = 16 - \frac{x}{100}$$

(a) $x = 66$
(b) $x = 50$
(c) $x = 42$
(d) $x = 54$

8. Find the value of the limit $\lim_{x\to\infty} \frac{x^7}{7^x}$.

(a) 7
(b) ∞
(c) 0
(d) 1

9. If $h(x) = x + \sqrt{x}$, find $h^{-1}(12)$.

(a) 9
(b) 8
(c) 6
(d) 11

10. For a function $y = \sin(2 \cdot \ln x)$, find the equation of the tangent line to the curve at the given point (1, 0).

(a) $y = -x + 1$
(b) $y = x - 1$
(c) $y = 2x - 2$
(d) $y = x$

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11. A particle move along a line. Its velocity (m/sec.) at time t is $v(t) = t^2 - t - 6$. Find the distance (m) traveled during the time period $1 \leq t \leq 4$

(a) 9/2
(b) -9/2
(c) 61/6
(d) -61/6

12. Find the area enclosed by the line $y = x - 1$ and the parabola $y^2 = 2x + 6$

(a) 16
(b) 18
(c) 20
(d) None of the above

13. Evaluate the integral $\int_1^2 \frac{\ln x}{x^2} dx$

(a) 0.5 - 0.5 ln2
(b) 0.5 ln2 - 0.5
(c) 0.5 + 0.5 ln2
(d) - 0.5 ln2 - 0.5

14. Find $\int \frac{1}{x^2-9} dx$

(a) $6 \ln\left|\frac{x-3}{x+3}\right| + C$

(b) $\frac{1}{6} \ln\left|\frac{x-3}{x+3}\right| + C$

(c) $6 \ln\left|\frac{x+3}{x-3}\right| + C$

(d) $\frac{1}{6} \ln\left|\frac{x+3}{x-3}\right| + C$

15. Evaluate $\int_1^\infty \frac{1}{(3x+1)^2} dx$

(a) 1/16
(b) -1/16
(c) 1/12
(d) -1/12

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16.Solve the equation $y' = x^2y$

(a) $y = Ae^{3x^3}$

(b) $y = Ae^{3x}$

(c) $y = Ae^{x/3}$

(d) $y = Ae^{x^3/3}$

17.Solve the differential equation $y' = x + 5y$

(a) $y = -\frac{1}{5}x - \frac{1}{25} + Ce^{5x}$

(b) $y = \frac{1}{5}x - \frac{1}{25} + Ce^{5x}$

(c) $y = \frac{1}{5}x - \frac{1}{25} + Ce^{-5x}$

(d) $y = -\frac{1}{5}x - \frac{1}{25} + Ce^{-5x}$

18.$f(x,y) = xe^{-x^2-y^2}$, find partial derivative $f_x(x, y)$

(a) $2xye^{-x^2-y^2}$

(b) $-2xye^{-x^2-y^2}$

(c) $e^{-x^2-y^2}(2x^2-1)$

(d) $e^{-x^2-y^2}(1-2x^2)$

19.$z = x^2 + xy + y^2$, $x = s + t$, $y = st$, use the Chain Rule to find $\frac{\partial z}{\partial s}$

(a) $x+2y+xs+2ys$

(b) $2x+y+xs+2ys$

(c) $x+2y+xt+2yt$

(d) $2x+y+xt+2yt$

20.Find the directional derivative of $f(x, y, z) = x^2 + y^2 + z^2$ at the point $P = (2,1,3)$ in the direction of the vector $u = [-2, -1, -3]$

(a) $-\sqrt{14}$

(b) $-2\sqrt{14}$

(c) $-3\sqrt{14}$

(d) $-4\sqrt{14}$