

國立屏東教育大學 102 學年度研究所碩士班入學考試

微積分(A) 試題

(應用物理系光電暨材料碩士班)

※請注意：答案須寫在答案卷上，否則不予計分。

計算題 (每題 10 分，共 100 分)

1. 請微分下式： $\frac{dy}{dx}$

(a) $y = \frac{x}{\sqrt{16-x^2}}$

(b) $y = x \ln(x^2 + a^2)$, a is constant.

2. (a) $f(x) = \sin(\sqrt{x})$, $\frac{df(x)}{dx} = ?$

(b) $f(x) = \tan(x) \ln x$, $\frac{df(x)}{dx} = ?$

3. (a) $\frac{d\sin^{-1}(2x)}{dx} = ?$

(b) $\frac{d10^{6x}}{dx} = ?$

4. Find $\int x \ln x dx$.

5. $\int_0^{\infty} e^{-2t} \cos(t) dt = ?$

6. Find solution of $y' = 1 + y^2$.

7. Find solution of $x^2 y'' + xy' + 9y = 0$.

8. $f(x, y, z) = x^2 + 2y^2 + z^2 - 2xy$, find $\nabla^2 f$.

9. $f(x, y) = x^2 - 3xy - y^2 + 3x - 10y + 1$, find the directional derivative in the direction of vector $\mathbf{u} = [1, 1]$.

10. An object of mass m is moving on a coordinate line subject to a force given by $F(t) = e^{-t}$ for time t . The motion is resisted by a frictional force that is numerically equal to twice the speed of the object. If $v = 0$ at $t = 0$, find the formula of $v(t)$ at any time $t > 0$.