

- ① Using the first principle differentiate the function $f(x) = e^{2x}$ with respect to x .

2pts

② If $y = \sin x + e^x$, find $\frac{dy}{dx}$

2 pts

③ If $y = x^2 + \sin^{-1}x + \log_e x$, find dy/dx

2 pts

(2pts) ④ If $y = e^x \sin x$ find $\frac{dy}{dx}$

Hint if $y = u(x)v(x)$
 $\frac{dy}{dx} = \left\{ \frac{d}{dx} u(x) \right\} v(x) + u(x) \left\{ \frac{d}{dx} v(x) \right\}$

⑤ If $y = \frac{x}{x^2+1}$, find $\frac{dy}{dx}$ (2pts)

Hint: Use the quotient rule as

If $y = \frac{u(x)}{v(x)}$, then

$$\frac{dy}{dx} = \frac{\left\{ \frac{d}{dx} u(x) \right\} v(x) - \left\{ \frac{d}{dx} v(x) \right\} u(x)}{\{v(x)\}^2}$$

⑥ Evaluate $\int \frac{(x+1)}{x^3+x^2-6x} dx$

4pts

⑦

Find the indefinite integral of $f(x) = 3x^2 + 4x - 2$

2 pts

⑧

Find $\int x \sin x \, dx$

Hint: Use integration parts:

$$\int u \, dv = uv - \int v \, du$$

4 pts

⑨ Solve the differential Equation

$$y' = 3x^2$$

2pts

⑩ Solve the equation:

$$(1+y^2)y' = \frac{3}{x}$$

2pts

Total:

24pts