156 Sample Exam (unofficial)

VV156 Teaching Group

October 2024

1 Ex1

Find the derivative of $(xsin^2x)^{\frac{1}{3}}$,$x \in (-\pi, \pi)$

2 Ex2

2.1

Find the derivative of x^{e^x}

2.2

Calculate $lim_{x\to 0^+}$f'(x)

3 Ex3

Solve the ODE
$x'' + 4x' + 8x = 0$,where $x(0) = 2$ and $x'(0) = -2$

4 Ex4

The tangent line of $f(x)$ at $x = 1$ is $y - 3 = -2(x - 1)$; $g(x) = f^{-1}(x) + x$.
Find the equation of the tangent line of $g(x)$ at $x = 3$

5 Ex5

Given that $f(x) = x^2 h(x)$, where $f(x)$ passes $(1, 3)$ and $h'(1) = 2$
Calculate $f'(1)$

6 Ex6

$f(x) = 4x^3 - x^4$

6.1

Find all of the critical points

6.2

Find the intervals where (i)f is increasing (ii)f is decreasing

6.3

Find the intervals where (i)f is convex (ii)f is concave

6.4

Evaluate the two critical points, find whether it is local max/min or neither

6.5

find all of the inflection points

7 Ex7

Given that $xy = arctan(xy)$, find $\frac{dy}{dx}$ at $y = \frac{1}{3}$

8 Ex8

Given that $f(x) = \frac{4x+2}{x^2+2}$,$x \in [-5, 4]$

8.1

Find all of the candidate points

8.2

Find the global max/min