

MATHEMATICS 201-203-RE

Integral Calculus

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Review of Differential Calculus

1. Find $\frac{dy}{dx}$.

a) $y = 3x^2 - \sqrt{x} + \frac{2}{x^4} + 4$

b) $y = \sqrt{2}x^2 - x^{\frac{1}{3}} - \frac{1}{\sqrt[5]{x^2}}$

c) $y = (2x^3 - 2)^{12}$

d) $y = \sqrt{3x-4}$

e) $y = \frac{x^2 - 5}{2x^3 + 1}$

f) $y = \ln(x^2 + 3)$

g) $y = 4^{3x+1}$

h) $y = x^2 \sin x$

i) $y = \sqrt{\cos x^2}$

j) $y = \tan^2 3x$

k) $y = \ln(\csc 5x)$

l) $y = e^{\cos x} + \cos(e^x)$

m) $y = \log_2 \sec x + \frac{1}{1 + \cot x}$

n) $y = \arcsin x^2 - x \arccos x$

o) $y = \ln(\arcsin \sqrt{x})$

p) $y = \arctan \frac{1}{x}$

q) $y = \sqrt{\ln x} + \ln \sqrt{x} + \sqrt{x} \ln x$

r) $y = (\sin x)^{\tan x}$

2. Find the differential dy .

a) $y = x^3 - \frac{1}{x} + \ln x$

b) $y = \sqrt{\frac{x-3}{x+3}}$

c) $y = \arctan 2x$

d) $y = \cot \sqrt{3x}$

e) $y = \sin 2x \cos 3x$

f) $y = \operatorname{arcsec} e^x$

Answers

1. a) $\frac{dy}{dx} = 6x - \frac{1}{2\sqrt{x}} - \frac{8}{x^5}$
- b) $\frac{dy}{dx} = 2\sqrt{2x} - \frac{1}{3x^{\frac{3}{2}}} + \frac{2}{5x^{\frac{5}{2}}\sqrt{x^2}}$
- c) $\frac{dy}{dx} = 72x^2(2x^3 - 2)^{11}$
- d) $\frac{dy}{dx} = \frac{3}{2\sqrt{3x-4}}$
- e) $\frac{dy}{dx} = \frac{-2x(x^3 - 15x - 1)}{(2x^3 + 1)^2}$
- f) $\frac{dy}{dx} = \frac{2x}{x^2 + 3}$
- g) $\frac{dy}{dx} = 4^{3x+1} 3 \ln 4$
- h) $\frac{dy}{dx} = 2x \sin x + x^2 \cos x$
- i) $\frac{dy}{dx} = \frac{-x \sin x^2}{\sqrt{\cos x^2}}$
- j) $\frac{dy}{dx} = 6 \tan 3x \sec^2 3x$
- k) $\frac{dy}{dx} = -5 \cot 5x$
- l) $\frac{dy}{dx} = -\sin x e^{\cos x} - e^x \sin(e^x)$
- m) $\frac{dy}{dx} = \frac{\tan x}{\ln 2} + \frac{\csc^2 x}{(1 + \cot x)^2}$
- n) $\frac{dy}{dx} = \frac{2x}{\sqrt{1-x^4}} - \arccos x + \frac{x}{\sqrt{1-x^2}}$
- o) $\frac{dy}{dx} = \frac{1}{2\sqrt{x-x^2} \arcsin \sqrt{x}}$
- p) $\frac{dy}{dx} = \frac{-1}{x^2 + 1}$
- q) $\frac{dy}{dx} = \frac{1}{2x\sqrt{\ln x}} + \frac{1}{2x} + \frac{\ln x}{2\sqrt{x}} + \frac{1}{\sqrt{x}}$
- r) $\frac{dy}{dx} = (\sin x)^{\tan x} (\sec^2 x \ln(\sin x) + 1)$
2. a) $dy = \left(3x^2 + \frac{1}{x^2} + \frac{1}{x} \right) dx$
- b) $dy = \frac{3}{\sqrt{(x-3)(x+3)^3}} dx$
- c) $dy = \frac{2}{1+4x^2} dx$
- d) $dy = \frac{-\sqrt{3} \csc^2 \sqrt{3x}}{2\sqrt{x}} dx$
- e) $dy = (2 \cos 2x \cos 3x - 3 \sin 2x \sin 3x) dx$
- f) $dy = \frac{1}{\sqrt{e^{2x} - 1}} dx$