

## MATHEMATICS 201-203-RE

Integral Calculus

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# XV – Arc Length

1. Find the length of the curve.

a)  $y = 2x - 5$  from  $(2, -1)$  to  $(5, 5)$

b)  $y = \frac{2}{3}x^{\frac{3}{2}} + 1$  from  $x = 0$  to  $x = 1$

c)  $y = \frac{x^3}{6} + \frac{1}{2x}$  from  $(1, \frac{2}{3})$  to  $(3, \frac{14}{3})$

d)  $y = \frac{x^4}{8} + \frac{1}{4x^2}$  over the interval  $[1, 8]$

e)  $y^2 = x^3$  from  $(0, 0)$  to  $(4, 8)$

f)  $x = \frac{2}{3}(y - 5)^{\frac{3}{2}}$  from  $(0, 5)$  to  $(\frac{2}{3}, 6)$

g)  $y = \frac{e^x + e^{-x}}{2}$  from  $x = 0$  to  $x = 2$

h)  $y = \left(1 - x^{\frac{3}{2}}\right)^{\frac{2}{3}}$  from  $x = 0$  to  $x = 1$

i)  $y = \ln x$  from  $(\sqrt{3}, \frac{1}{2} \ln 3)$  to  $(2\sqrt{2}, \frac{3}{2} \ln 2)$

2. Find the arc length function for the given curve starting at the point  $P_0$ .

a)  $y = 2x^{\frac{3}{2}}$   $P_0(1, 2)$

b)  $y = \ln(\sec x)$   $P_0(\frac{\pi}{6}, \ln 2 - \frac{1}{2} \ln 3)$

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## Answers

1. a)  $3\sqrt{5}$

d)  $\frac{131103}{256}$

g)  $\frac{e^2}{2} - \frac{1}{2e^2}$

2. a)  $s(x) = \frac{2}{27}(9x+1)^{\frac{3}{2}} - \frac{20\sqrt{10}}{27}$

b)  $\frac{4}{3}\sqrt{2} - \frac{2}{3}$

e)  $\frac{80}{27}\sqrt{10} - \frac{8}{27}$

h)  $\frac{3}{2}$

b)  $s(x) = \ln|\tan x + \sec x| - \frac{1}{2} \ln 3$

c)  $\frac{14}{3}$

f)  $\frac{4}{3}\sqrt{2} - \frac{2}{3}$

i)  $1 - \frac{1}{2} \ln 2 + \frac{1}{2} \ln 3$