

Math 243

Spring 2017

Asst 6

Selected Solutions

§6.3:

(4) ~~2/16~~ Step 1: Find $\frac{dx}{dt}$ & $\frac{dy}{dt}$

$$\frac{dx}{dt} = t \quad \frac{dy}{dt} = \frac{3}{2} \frac{(2+t)^{1/2}}{3} \cdot 2$$
$$= \sqrt{2+t}$$

Step 2: Plug into the formula:

$$L = \int_0^4 \sqrt{t^2 + (\sqrt{2+t})^2} dt$$
$$= \int_0^4 \sqrt{t^2 + 2+t} dt$$

Step 3: Evaluate:

$$L = \int_0^4 \sqrt{(t+1)^2} dt$$

$$= \int_0^4 (t+1) dt$$

$$= \left. \frac{t^2}{2} + t \right|_0^4 = \frac{16}{2} + 4 = \boxed{12}$$

(8) Step 1: Find $f'(x)$:

$$f(x) = x^{3/2} \text{ so } f'(x) = \frac{3}{2} \sqrt{x}$$

Step 2: Plug into formula:

$$L = \int_0^4 \sqrt{1 + f'(x)^2} dx = \int_0^4 \sqrt{1 + \frac{9}{4}x} dx$$

Step 3: Evaluate:

$$u = 1 + \frac{9}{4}x$$

$$du = \frac{9}{4} dx$$

$$= \int_1^{10} \frac{4}{9} \sqrt{u} du = \frac{4}{9} \frac{2}{3} u^{3/2} \Big|_1^{10}$$

$$= \boxed{\frac{8}{27} (\sqrt{100} - 1)}$$

(1)

(18)(a) Step 1: Find y'

$$y = \tan(x) \text{ so } y' = \sec^2(x)$$

Step 2: Plug in:

$$L = \int_{-\pi/3}^0 \sqrt{1 + \sec^4(x)} dx$$

(22)(a) Step 1: Find y'

$$y = \sin(x) - x \cos(x)$$

$$\text{so } y' = \cos(x) + x \sin(x) - \cos(x) \\ = x \sin(x)$$

Step 2: Plug in

$$L = \int_0^{\pi} \sqrt{1 + x^2 \sin^3(x)} dx$$