Principles of Calculus Modeling: An Interactive Approach by Donald Kreider, Dwight Lahr, and Susan Diesel
Exercises for Section 4.9

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1. (1 pt)
Find the length of the curve $y = \frac{4}{3}x^{\frac{3}{2}}$ between $x = 0$ and $x = 1$.
Length = ____________

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2. (1 pt)
Find the length of the curve $y = \frac{x^5}{20} + \frac{1}{3x^3}$ between $x = 3$ and $x = 4$.
Length = ____________

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3. (1 pt)
Find the length of the curve $y = 2x^2 - \frac{\ln x}{16}$ between $x = 3$ and $x = 6$.
Length = ____________

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4. (1 pt)
What is the length of the curve $y = \ln(\sin x)$ between $x = \frac{\pi}{4}$ and $x = \frac{\pi}{3}$?
___

A. $\ln(\sqrt{2}-1) - \ln\frac{\sqrt{3}}{3}$ units
B. $\ln(2+\sqrt{3}) - \ln(\sqrt{2}+1)$ units
C. $\ln\frac{\sqrt{3}}{3} - \ln(2-\sqrt{3})$ units
D. $\ln\frac{\sqrt{3}}{3} - \ln(\sqrt{2}-1)$ units
E. $\ln(2+\sqrt{3}) - \ln\sqrt{3}$ units

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5. (1 pt)
Using the trapezoid rule with 7 subintervals, evaluate the integral that defines the length of the curve $y = x^4$ from $x = 0$ to $x = 1$. You may use Maple or another computer algebra program to find the answer. Enter the answer to 6 decimal places.
Length = ____________

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6. (1 pt)
Using the trapezoid rule with 6 subintervals, evaluate the integral that defines the length of the arc of the ellipse $x^2 + 2y^2 = 2$ between $(0,1)$ and $(1, \frac{1}{\sqrt{2}})$. You may use Maple or another computer algebra program to find the answer. Enter the answer to 6 decimal places.
Length = ____________

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7. (1 pt)
Set up an integral for finding the arc length of the graph of $y = y^3 - x$ from (0, -1) to (6, 2).
variable of integration = ___
integrand = ____________
lower limit of integration = ____________
upper limit of integration = ____________

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8. (1 pt)
Set up an integral for finding the arc length of the graph of $2y^3 - 7y + 2x - 8 = 0$ from (4, 0) to (6.5, 1).
variable of integration = ___
integrand = ____________
lower limit of integration = ____________
upper limit of integration = ____________

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9. (1 pt)
Let $G(x) = \frac{d}{dx} f(x)$. What quantity is described by the integral $\int_a^b \sqrt{1 + G'(x)^2}dx$?
___

A. the arclength of the curve $f(x)$ from a to b
B. the arclength of the curve $\sqrt{1+G(x)}$ from a to b
C. the arclength of the curve $G(x)$ from a to b
D. the arclength of the curve $f(x)^2$ from a to b
E. none of the above.

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10. (1 pt)
Evaluate $\int_{-1.5}^{3} \sqrt{\frac{9}{9-x^2}}dx$.
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11. (1 pt)
What is the integral formula for the length of the curve $y = \ln(x)$ from x = 5 to x = 26?
Length = $\int_5^{26}$ ____________ dx
Now approximate this integral using 8 circumscribed rectangles.
____

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12. (1 pt)
What is the length of one cycle of the curve $y = \cos^8(x)$, approximated using the arclength formula with 13 midpoint rectangles?
____

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13. (1 pt)
Consider the curve $y = \sqrt{256 - x^2}$ from x = -16 to x = 16. Approximate its length using the arclength formula with 16 midpoint rectangles.
____

Calculate the exact length using geometric formulas.
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14. (1 pt)
Find the length of the parabolic curve $y = \frac{x^2}{12}$ from $x = 0$ to $x = 15$, accurate to 3 decimal places, using the trapezoid rule.
Length = ____________

15. (1 pt)
Approximate the length of the curve $y = \cos(x)$ from $x = 0$ to $x = \frac{\pi}{5}$ using 20 trapezoids.

____

16. (1 pt)
Approximate the length of the curve $y = x^2$ from $x = 0$ to $x = 1$ using 1370 trapezoids.

____

Now approximate the length of the curve $y = x^3$ from $x = 0$ to $x = 1$ using 1370 trapezoids.

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Now approximate the length of the curve $y = x^4$ from $x = 0$ to $x = 1$ using 1370 trapezoids.

____

17. (1 pt)
What is the circumference of the hypocycloid $x^{2/3} + y^{2/3} = 15$?

____

18. (1 pt)
What is the length of the curve $x = 2y^3 + \frac{1}{34y}$ from $y = 1$ to $y = 17$?

____

19. (1 pt)
Consider the ellipse given by $\frac{x^2}{36} + \frac{y^2}{100} = 1$. Set up an integral to find the length of the upper half of this ellipse (the portion above the x axis). The function to be integrated should be simplified as much as possible, with no negative exponents.

Length = $\int_a^b (1+$ __________ $)^{1/2}$ dx

a = _____

b = _____

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