

(a) Let  $Q$  be square  $D_1$ ,  $Q_2 = L_1 \times L_2$ , let  $Q_3$  be square  $D_2$ ,  $R = (3, -2)$ .

$$\text{Total length of arcs: } R(t) = (1 + t^2)^{3/2} + ((3-t)^2 + 4)^{3/2}$$

$$R'(t) = \frac{3}{2}(1+t^2)^{1/2} + \frac{3(3-t)}{(3-t)^2 + 4}$$

The shaded  $R(t)$ ,  $R'(t) = 0$

$$\frac{3}{2}(1+t^2)^{1/2} + \frac{3(3-t)}{(3-t)^2 + 4} = 0$$

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(b) Let  $f(x) = \sqrt{x+3}$

$$f'(x) = \frac{1}{2\sqrt{x+3}}$$

$$f''(x) = -\frac{1}{4(x+3)^{3/2}}$$

$$f'''(x) = \frac{3}{8(x+3)^{5/2}}$$

$$f^{(4)}(x) = -\frac{15}{16(x+3)^{7/2}}$$

$$f^{(5)}(x) = \frac{105}{128(x+3)^{9/2}}$$

$$f^{(6)}(x) = -\frac{945}{2048(x+3)^{11/2}}$$

$$f^{(7)}(x) = \frac{6735}{262144(x+3)^{13/2}}$$

(c) Let  $f(x) = \sqrt{x+3}$ ,  $f'(x) = \frac{1}{2\sqrt{x+3}}$

$$f''(x) = -\frac{1}{4(x+3)^{3/2}}$$

$$f'''(x) = \frac{3}{8(x+3)^{5/2}}$$

$$f^{(4)}(x) = -\frac{15}{16(x+3)^{7/2}}$$

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$$f^{(6)}(x) = -\frac{945}{2048(x+3)^{11/2}}$$

$$f^{(7)}(x) = \frac{6735}{262144(x+3)^{13/2}}$$

(d) Let  $f(x) = \sin(x)$ ,  $f'(x) = \cos(x)$ ,  $f''(x) = -\sin(x)$

$$f'''(x) = -\cos(x)$$

$$f^{(4)}(x) = \sin(x)$$

$$f^{(5)}(x) = \cos(x)$$

$$f^{(6)}(x) = -\sin(x)$$

$$f^{(7)}(x) = -\cos(x)$$

$$f^{(8)}(x) = \sin(x)$$

$$f^{(9)}(x) = \cos(x)$$

$$f^{(10)}(x) = -\sin(x)$$

$$f^{(11)}(x) = -\cos(x)$$

$$f^{(12)}(x) = \sin(x)$$

$$f^{(13)}(x) = \cos(x)$$

$$f^{(14)}(x) = -\sin(x)$$

$$f^{(15)}(x) = -\cos(x)$$

$$f^{(16)}(x) = \sin(x)$$

$$f^{(17)}(x) = \cos(x)$$

$$f^{(18)}(x) = -\sin(x)$$

$$f^{(19)}(x) = -\cos(x)$$

$$f^{(20)}(x) = \sin(x)$$

$$f^{(21)}(x) = \cos(x)$$

$$f^{(22)}(x) = -\sin(x)$$

$$f^{(23)}(x) = -\cos(x)$$

$$f^{(24)}(x) = \sin(x)$$

$$f^{(25)}(x) = \cos(x)$$

$$f^{(26)}(x) = -\sin(x)$$

$$f^{(27)}(x) = -\cos(x)$$

$$f^{(28)}(x) = \sin(x)$$

$$f^{(29)}(x) = \cos(x)$$

$$f^{(30)}(x) = -\sin(x)$$

$$f^{(31)}(x) = -\cos(x)$$

$$f^{(32)}(x) = \sin(x)$$

$$f^{(33)}(x) = \cos(x)$$

$$f^{(34)}(x) = -\sin(x)$$

$$f^{(35)}(x) = -\cos(x)$$

$$f^{(36)}(x) = \sin(x)$$

$$f^{(37)}(x) = \cos(x)$$

$$f^{(38)}(x) = -\sin(x)$$

$$f^{(39)}(x) = -\cos(x)$$

$$f^{(40)}(x) = \sin(x)$$

$$f^{(41)}(x) = \cos(x)$$

$$f^{(42)}(x) = -\sin(x)$$

$$f^{(43)}(x) = -\cos(x)$$

$$f^{(44)}(x) = \sin(x)$$

$$f^{(45)}(x) = \cos(x)$$

$$f^{(46)}(x) = -\sin(x)$$

$$f^{(47)}(x) = -\cos(x)$$

$$f^{(48)}(x) = \sin(x)$$

$$f^{(49)}(x) = \cos(x)$$

$$f^{(50)}(x) = -\sin(x)$$

$$f^{(51)}(x) = -\cos(x)$$

$$f^{(52)}(x) = \sin(x)$$

$$f^{(53)}(x) = \cos(x)$$

$$f^{(54)}(x) = -\sin(x)$$

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$$f^{(56)}(x) = \sin(x)$$

$$f^{(57)}(x) = \cos(x)$$

$$f^{(58)}(x) = -\sin(x)$$

$$f^{(59)}(x) = -\cos(x)$$

$$f^{(60)}(x) = \sin(x)$$

$$f^{(61)}(x) = \cos(x)$$

$$f^{(62)}(x) = -\sin(x)$$

$$f^{(63)}(x) = -\cos(x)$$

$$f^{(64)}(x) = \sin(x)$$

$$f^{(65)}(x) = \cos(x)$$

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$$f^{(67)}(x) = -\cos(x)$$

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$$f^{(69)}(x) = \cos(x)$$

$$f^{(70)}(x) = -\sin(x)$$

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