Math 132 - October 19 2016

Arc Length \( L = \int_a^b ds = \int_a^b \sqrt{1 + (f'(x))^2} \, dx = \int_a^b \sqrt{1 + (dy/dx)^2} \, dx = \int_a^b \sqrt{1 + (dx/dy)^2} \, dx \)

Surface Area \( S = \int_a^b dS = \int_a^b 2\pi r \, ds = \int_a^b 2\pi r \sqrt{1 + (dy/dx)^2} \, dx = \int_a^b 2\pi r \sqrt{1 + (dx/dy)^2} \, dy \)

Warm-up Problems

1. Find the length of the line segment between the points \((x_i, f(x_i))\) and \((x_j, f(x_j))\).

2. **Clicker** Find the surface area of the cone
   - (a) \(\pi rl\)
   - (b) \(2\pi rl\)
   - (c) \(\pi(r^2 + l^2)\)
   - (d) \(\pi \sqrt{r^2 + l^2}\)
   - (e) IDK but

3. **Clicker** Find the surface area of the frustum of the cone.
   - (a) \(\pi lr_1\)
   - (b) \(\pi lr_2\)
   - (c) \(\pi l(r_1 + r_2)\)
   - (d) \(\pi l(r_2 - r_1)\)
   - (e) I don’t know

Class Problems

4. Set up arc length integrals (don’t compute, just set up!)
   - (a) Find length of \(y = 2x + 3\) between \(x = 0\) and \(x = 2\)
   - (b) Find length of \(y = \cos x\) between \(x = 0\) and \(x = \pi\)
   - (c) Find length of \(y = 2(x - 1)^{3/2}\) from \(x = 1\) to \(x = 5\).

5. Set up surface area integrals
   - (a) Find the area of \(y = \sqrt{x}\) on the interval \([3/4, 15/4]\) rotated about the \(x\)-axis.
   - (b) Find the area of \(x = \frac{\theta}{\pi}\) on the interval \(y = 0\) to \(y = 1\) rotated about the \(y\)-axis.
   - (c) Find the area of \(y = \sin x\) from \(x = 0\) to \(x = \pi\).