Mathematics 126, Fourth 8.1, Arc length

Give all approximations to 3 decimal accuracy.

1. Use fnInt to estimate the length of the arc determined by $y = \frac{x^2}{2}$ from (0,0) to $\left(\frac{1}{2}, \frac{1}{8}\right)$.

$\frac{dy}{dx} = \frac{2x}{2} = x$

$$AL = \int_0^{1/2} \sqrt{1+x^2}\, dx \approx 0.520114409 7$$

2. Use fnInt to estimate the length of the curve $y = 2x + \cos(x)$, $0 \le x \le 2\pi$.

$\frac{dy}{dx} = 2 - \sin(x)$

$$AL = \int_0^{2\pi} \sqrt{1+(2-\sin(x))^2}\, dx \approx 14.207396 49$$

3. Set up an integral expression for the perimeter of the region bounded by $f(x) = 3x^2 - 24x - 27$ and $g(x) = -5x^2 + 40x + 45$.

$f(x) = g(x)$

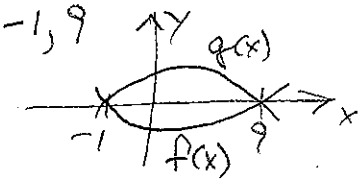
$3x^2 - 24x - 27 = -5x^2 + 40x + 45$

$8x^2 - 64x - 72 = 0$

$8(x^2 - 8x - 9) = 0$

$8(x-9)(x+1) = 0$

$x = -1, 9$



Perimeter: $f'(x) = 6x - 24$

$g'(x) = -10x + 40$

$$P = \int_{-1}^{9} \left(\sqrt{1+(6x-24)^2} + \sqrt{1+(40-10x)^2} \right) dx$$

Understand the methods so you can solve similar problems.
Understand the concepts so you can solve unfamiliar problems.
Study the (a) class notes, (b) text examples, (c) do the text exercises, and (d) do the 4th hour problems.