Math 122 (Section 11) **Quiz 9 Solutions** **Fall 2007**

1. $\int \left(8e^{2x} - \frac{1}{5x} + 3\right)\, dx = 4e^{2x} - \frac{1}{5}\ln x + 3x + C$

2. $\int_1^2 \left(30x^2 - 6x\right)\, dx = \left[10x^3 - 3x^2\right]_1^2 = 68 - 7 = 61$

3.
$$\begin{aligned} \text{change in height } &= \int_0^4 35te^{-t}\, dt = 31.79 \text{ inches} \\ \text{height } &= 53 \text{ inches } + 31.79 \text{ inches } = 84.79 \text{ inches} \end{aligned}$$

4.
$$\text{change in population } = \int_{20}^{30} 5e^{0.03t}\, dt \approx 106 \text{ people}$$

5. $\int_{-4}^{6} f(x)\, dx = 48 - 18 = 30.$

6. $\int_0^{10} f(x)\, dx \approx 17.5 \times 8 = 140.$

7. We set the two functions equal to determine the intersection points.

$$x^4 - 7x^2 + 5 = 86 - 7x^2$$
$$x^4 - 81 = 0$$
$$(x^2+9)(x^2-9) = 0$$
$$(x^2+9)(x+3)(x-3) = 0$$

The graphs intersect when $x = -3$ and $x = 3$. Thus we have that

$$\text{area } = \int_{-3}^{3} \left(\left(86 - 7x^2\right) - \left(x^4 - 7x^2 + 5\right)\right) dx = \boxed{388.8}$$

8.
$$\begin{aligned} \text{Area } &= \int_{-1}^{0} \left(x^3 - x^2 - 2x\right)\, dx + \left|\int_0^2 \left(x^3 - x^2 - 2x\right)\, dx\right| \\ \text{Area } &= 0.41\overline{6} + 2.\overline{6} = 3.08\overline{3} \end{aligned}$$