1. Evaluate

a) $\int \frac{e^x}{4e^x+6}\,dx$

b) $\int_{e^2}^{e^8} \frac{dx}{x\ln x}$

c) $\int_1^4 \frac{10\sqrt{x}}{\sqrt{x}}\,dx$

d) $\int \frac{x+4}{x^2+8x+25}\,dx$

e) $\int_{\ln 2}^{\ln 3} \coth x\,dx$

f) $\int \frac{dx}{\sqrt{x^2-9}}, \quad x>3$

g) $\int \frac{e^x}{\sqrt{e^{2x}+4}}\,dx$

h) $\int_0^1 \frac{x^2}{9-x^6}\,dx$

2. The mass of radioactive material in a sample has decreased by 30% since the decay began. Assuming a half-life of 1500 *years*, how long ago did the decay begin?

3. Growing from an initial population of 150,000 at a constant annual growth rate of 4%/*yr*., how long will it take a city to reach a population of 1 million?

4. A savings account advertises an annual percentage yield (APY) of 5.4%, which means that the balance in the account increases at an annual growth rate of 5.4%/*yr*.

a) Find the balance in the account for $t \ge 0$ with an initial deposit of $1500, assuming the APY remains fixed and no additional deposits or withdrawals are made.

b) What is the doubling time of the balance?

c) After how many years does the balance reach $5,000?

5. Compute the following derivatives

a) $\frac{d^6}{dx^6}(\cosh x)$

b) $\frac{d}{dx}(x\,\operatorname{sech} x)$

6. Find the area of the region bounded by the curves $f(x)=8\,\operatorname{sech}^2 x$ and $g(x)=\cosh x$

7. Evaluate $\lim_{x\to\infty} (\tanh x)^x$