1. How do we define $e^x$? How do we define $a^x$ for a generic real number $a > 0$? How do we define $\log_a(x)$?

2. Graph $y = 2^x$, $y = (1/2)^x$, $y = \log_2(x)$ and $y = \log_{1/2}(x)$ together on the same axes without using a graphing calculator.

3-8. Differentiate the following functions.

3. $f(x) = x^\pi$\hfill 4. $g(x) = \pi^x$

5. $p(t) = 12(1/2)^{3t}$\hfill 6. $s(t) = \log_{10}(t^2 + t)$

7. $h(x) = \frac{2^x}{1 + \tan x}$\hfill 8. $f(y) = \cos y \log_2 y$

9-14. Evaluate the following integrals.

9. $\int_0^8 10^{2x} \, dx$\hfill 10. $\int_{-1}^1 \frac{2^x}{1 + 2^x} \, dx$

11. $\int_0^3 \frac{t \log_{10}(1 + t^2)}{1 + t^2} \, dt$\hfill 12. $\int x \sqrt{2} \, dx$

13. $\int \frac{(\log_2 y)^2}{y} \, dy$\hfill 14. $\int_0^4 10^{\pi + \log_2(10)} \, dy$

15. Use the Trapezoid, Midpoint or Simpson’s Rule (your choice) to approximate

$$\int_1^{10} \log_2 x \, dx$$

with an error less than $10^{-2}$. Be sure to show that your approximation has the required accuracy.