7. $$\int \frac{v^2+2v+1}{v(v^2+1)}dv$$

$$\frac{v^2+2v+1}{v(v^2+1)} = \frac{A}{v} + \frac{Bv+C}{v^2+1}$$
$$v^2+2v+1 = A(v^2+1) + (Bv+C)v$$
$$= Av^2 + A + Bv^2 + Cv$$

$$v^2 : 1 = A + B$$
$$v^1 : 2 = C$$
$$v^0 : 3 = A$$

$$\Rightarrow B = 0$$

$$\Rightarrow \int \frac{v^2+2v+1}{v(v^2+1)}dv = \int \frac{1}{v} + \frac{2}{v^2+1}dv = \ln|v| + 2\arctan(v) + K$$

10. Use the trapezoid, midpoint, and Simpson's rule, each with 4 subdivisions, to estimate

$$\int_{-3}^{5} 2^x \, dx.$$

TRAP(4) $= \frac{\Delta x}{2}\left[f(x_0) + 2f(x_1) + 2f(x_2) + \cdots + 2f(x_{n-1}) + f(x_n)\right]$

$= \frac{2}{2}\left[2^{-3} + 2\cdot 2^{-1} + 2\cdot 2^{1} + 2\cdot 2^{3} + 2^{5}\right]$

= 53.125

MID(4) $= \Delta x\left[f(x_0^*) + f(x_1^*) + f(x_2^*) + \cdots + f(x_{n-1}^*)\right]$

$= 2\left[2^{-2} + 2^{0} + 2^{2} + 2^{4}\right]$

= 42.5

SIMP(4) $= \frac{\Delta x}{3}\left[f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + \cdots + 4f(x_{n-1}) + f(x_n)\right]$

$= \frac{2}{3}\left[2^{-3} + 4\cdot 2^{-1} + 2\cdot 2^{1} + 4\cdot 2^{3} + 2^{5}\right]$

= 46.75