

# Home work 1 - Introduction and Review

$$1) \lim_{x \rightarrow 0} e^x = 1$$

$$2) \lim_{x \rightarrow \infty} 3^x = \infty$$

$$3) \lim_{x \rightarrow \infty} 3^{-x} = 0$$

$$4) \lim_{x \rightarrow -\infty} 3^x = 0$$

$$5) \lim_{x \rightarrow 0^+} \ln x = -\infty$$

$$6) \lim_{x \rightarrow \infty} \ln x = \infty$$

$$7) \lim_{x \rightarrow -\infty} \ln |x| = \infty$$

$$8) \int_0^4 2^x dx$$

$$= \frac{2^x}{\ln 2} \Big|_0^4$$

$$= \frac{1}{\ln 2} (16 - 1)$$

$$= \frac{15}{\ln 2}$$

$$9) \int e^{4x+2} dx$$

$$= \int e^2 e^{4x} dx$$

$$= e^2 \left( \frac{1}{4} \right) e^{4x} + C$$

$$10) \int \sinh(5x) dx$$

$$= \frac{1}{5} \cosh(5x) + C$$

$$11) \int_0^1 \cosh x dx$$

$$= \sinh x \Big|_0^1$$

$$= \sinh 1$$

$$= \frac{e^1 - e^{-1}}{2}$$

$$= \frac{e^2 - 1}{2e}$$

$$12) \int \sinh^2 x dx$$

$$= \int \left( \frac{e^x - e^{-x}}{2} \right)^2 dx$$

$$= \int \frac{1}{4} (e^{2x} - 2 + e^{-2x}) dx$$

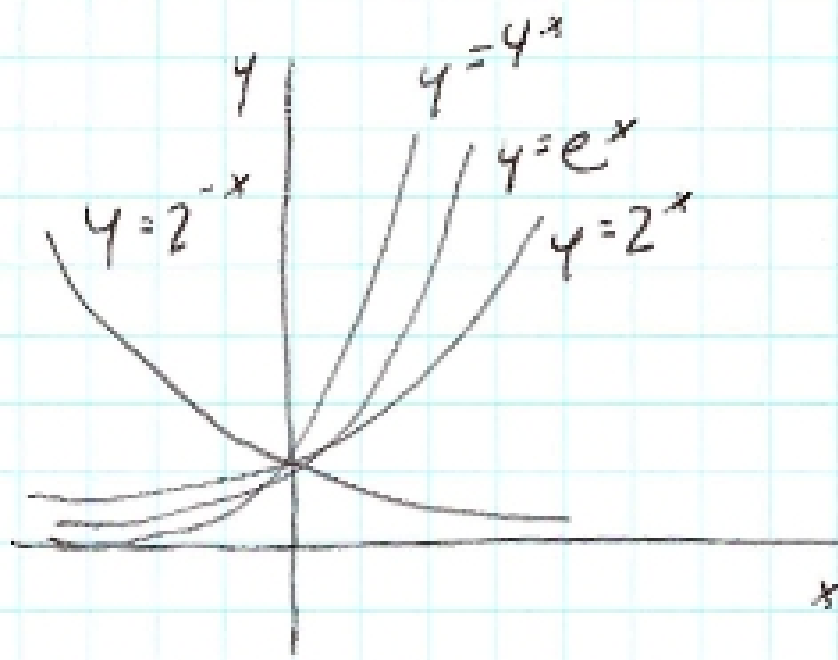
$$= \frac{1}{4} \left( \frac{1}{2} e^{2x} - 2x - \frac{1}{2} e^{-2x} \right)$$

$$= \frac{1}{8} e^{2x} - \frac{x}{2} - \frac{1}{8} e^{-2x} + C$$

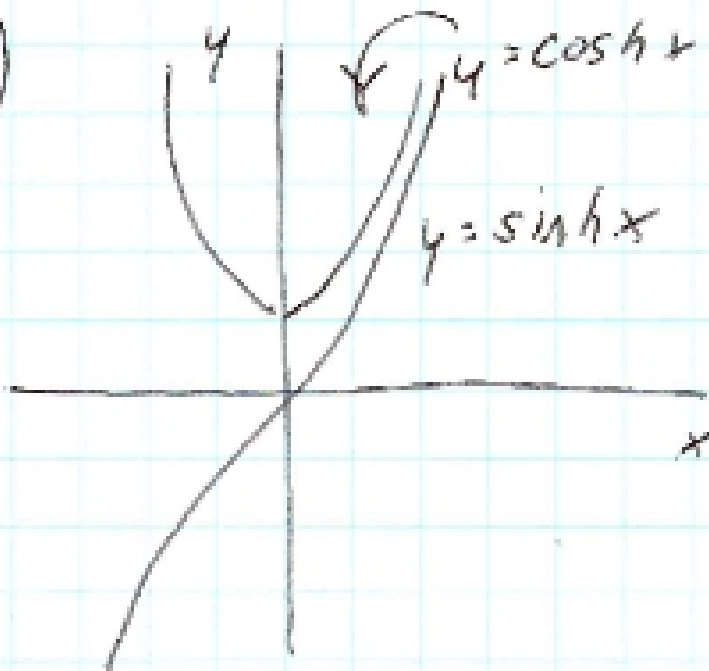
$$13) y = \ln(5x) \quad y' = \frac{1}{x}$$

$$14) y = 5 \cdot 4^x \quad y' = 5 \cdot 4^x \ln 4$$

15)



16)



17)  $e^x \gg 2^x \gg x^2 \gg \sqrt{x} \gg \ln x$

18) a) F

b) T

c) F  $\ln\left(\frac{5e^x}{x^2}\right) = \ln 5 + \ln(e^x) - \ln(x^2) = \ln 5 + x - 2 \ln x$

d) F

e) T

f) T

g) F

h) F

i) T

j) F