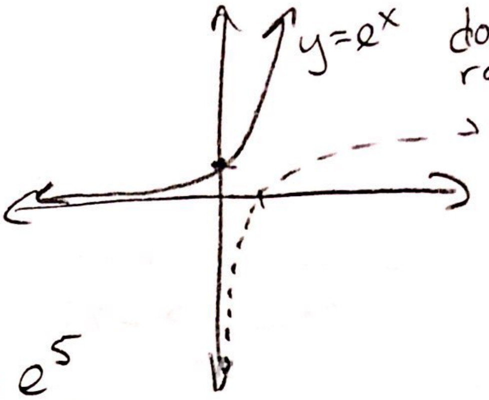
5.4 $y=e^x$

$\lim_{x\to-\infty} e^x=0$

$\lim_{x\to\infty} e^x=\infty$

$\lim_{x\to 5} e^x=e^5$

$\lim_{x\to 0} e^x=1$



domain: $(-\infty,\infty)$
range: $(0,\infty)$

$y=e^x$

$\ln y=\ln e^x$

$\ln y=x$

$\frac{y'}{y}=1$

$y'=y$

$y'=e^x$

d: $(-\infty,\infty)$

$y=3x^2e^x$ Where ↑, ↓, local extrema

$y'=6xe^x+3x^2e^x=3xe^x(2+x)=0$

$x=0$ $\neq 0$ $x=-2$

$+$ | $-$ | $+$
-2 0

$\uparrow(-\infty,-2)\cup(0,\infty)$ b/c $y'>0$

$\downarrow(-2,0)$ b/c $y'<0$

max $x=-2$ $(-2,12e^{-2})$ b/c y' ch. + to −

min $x=0$ $(0,0)$ b/c y' ch − to +

$y=e^{x^3-6x+4}$

$\boxed{y'=(3x^2-6)e^{x^3-6x+4}}$

$y=4x^3e^{\tan x}$

$y'=12x^2e^{\tan x}+4x^3\sec^2x\,e^{\tan x}$

$y=\cancel{e^{\ln}}x^3=x^3$

$\boxed{y'=3x^2}$

$y'=\frac{3e^{\ln x^3}}{x}=\frac{3}{x}e^{\ln x^3}$

$=\frac{3}{x}(x^3)$

$$\int e^x\,dx = e^x + c$$

$$\int e^u\,du = e^u + c$$

$$\int \sin x\, e^{\cos x}\,dx$$

$u = \cos x$

$du = -\sin x\,dx$

$$-\int e^u\,du = \boxed{-e^{\cos x} + c}$$

$$\int \frac{\boxed{e^{2x}\,dx}}{1+e^{2x}}$$

$u = 1 + e^{2x}$

$du = 2\underbrace{e^{2x}\,dx}$

$\frac{1}{2}du = e^{2x}\,dx$

$$\frac{1}{2}\int \frac{1}{u}\,du$$

$$= \boxed{\frac{1}{2}\ln\left|1+e^{2x}\right| + c}$$

$$\int \frac{e^{2x}+2e^x+1}{e^x}\,dx = \int\left(\frac{e^{2x}}{e^x} + \frac{2e^x}{e^x} + \boxed{\frac{1}{e^x}}\right)dx$$

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

$$\boxed{e^x + 2x - e^{-x} + c}$$