$f(x) \quad \cdot \quad g(x)$

33. $f(x) = e^x \cdot \cos(x)$

$$f'(x) = \frac{d}{dx}[e^x \cdot \cos(x)] = e^x \cdot \frac{d}{dx}[\cos(x)] + \cos(x) \cdot \frac{d}{dx}[e^x]$$

$$\| \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \|$$

$$e^x \cdot -\sin(x) \quad + \quad \cos(x) \cdot e^x$$

$$\boxed{f'(x) = e^x(-\sin(x)) + e^x\cos(x)}$$

$\frac{d}{dx}[e^x]$

$\|$

$f(x+h) = e^{x+h}$

$f(x) = e^x$

$\downarrow$

$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$

$\|$

$\lim_{h\to 0} \frac{e^{x+h} - e^x}{h}$

$\|$

$\lim_{h\to 0} \frac{e^x \cdot e^h - e^x}{h}$

$\|$

$\lim_{h\to 0} \frac{e^x(e^h - 1)}{h}$

$\|$

$e^x \cdot \lim_{h\to 0} \frac{(e^h - 1)}{h}$

$\|$

$e^x \cdot 1$

$\|$

e^x

Def

$$\lim_{h\to 0} \frac{(e^h - 1)}{h} = 1$$

$$f''(x) = \frac{d}{dx}\left[e^x(-\sin(x)) + e^x\cos(x)\right]$$

$$\frac{d}{dx}\left[\overset{f(x)}{e^x}\cdot\cos(x) - \overset{g(x)}{e^x}\cdot\sin(x)\right]$$

$$\frac{d}{dx}\left[\overset{f(x)}{e^x}\overset{g(x)}{\cos(x)}\right] - \frac{d}{dx}\left[\overset{f(x)}{e^x}\overset{g(x)}{\sin(x)}\right]$$

$$e^x\cdot\frac{d}{dx}[\cos(x)] + \cos(x)\cdot\frac{d}{dx}[e^x] - e^x\cdot\frac{d}{dx}[\sin(x)] + \sin(x)\cdot\frac{d}{dx}[e^x]$$

$$e^x\cdot -\sin(x) + \cos(x)\cdot e^x - -e^x\cdot\cos(x) + \sin(x)\cdot e^x$$

$$(-\sin(x))e^x + e^x\cos(x) - \left(e^x\cos(x) + e^x\sin(x)\right)$$

$$-e^x\sin(x) + e^x\cancel{\cos(x)} - e^x\cancel{\cos(x)} - e^x\sin(x)$$

$$-2e^x\sin(x)$$

$$\boxed{f''(x) = -2e^x\sin(x)}$$