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$y = x^2 \cdot e^{-3x}$. Find y'.

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

$$= 2xe^{-3x} + x^2 \cdot e^{-3x} \cdot (-3).$$

$$= 2xe^{-3x} - 3x^2e^{-3x}.$$

3.4 #45

$$y = \underset{1}{\cos}\underset{2}{\sqrt{\underset{3}{\sin}(\underset{4}{\tan}\underbrace{\pi x}_{5})}}$$

$$y' = -\sin\left(\sqrt{\sin(\tan \pi x)}\right) \cdot \tfrac{1}{2}(\sin(\tan \pi x))^{-1/2} \cdot \cos(\tan \pi x) \cdot \sec^2(\pi x) \cdot \pi.$$

3.2 #25 $f(x) = \dfrac{x}{x + \frac{c}{x}} = \dfrac{x}{x + cx^{-1}}$

$$f'(x) = \frac{1 \cdot (x + cx^{-1}) - x(1 - cx^{-2})}{(x + cx^{-1})^2}.$$

$$f(x) = x\left(x + \tfrac{c}{x}\right)^{-1}.$$

3.3 #43 $\lim_{x\to 0} \frac{\sin 3x}{5x^3-4x}$ $\qquad \frac{\sin h}{h} \to 1$ as $h \to 0$

$$\frac{\sin 3x}{5x^3-4x} = \frac{\sin 3x}{3x\left(\frac{5}{3}x^2-\frac{4}{3}\right)}$$

as $x\to 0$, $3x\to 0$, so $\frac{\sin 3x}{3x}\to 1$ & $\frac{5}{3}x^2-\frac{4}{3}\to -\frac{4}{3}$

$$\frac{\sin 3x}{5x^3-4x} \to 1\cdot\frac{1}{-\frac{4}{3}} = \frac{-3}{4}.$$

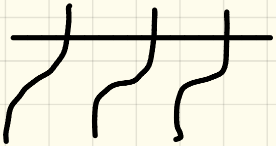
3.R #56 $\lim_{t\to 0} \frac{t^3}{\tan^3(2t)}$

$$\frac{t^3}{\tan^3(2t)} = \frac{t\cdot t\cdot t}{\frac{\sin 2t}{\cos 2t}\cdot\frac{\sin 2t}{\cos 2t}\cdot\frac{\sin 2t}{\cos 2t}} = \frac{1}{\underbrace{\frac{2\sin 2t}{2t}}_{\to 1}\cdot\underbrace{\frac{1}{\cos 2t}}_{\to 1}\cdot\underbrace{\frac{2\sin 2t}{2t}}_{\to 1}\cdot\underbrace{\frac{1}{\cos 2t}}_{\to 1}\cdot\underbrace{\frac{2\sin 2t}{2t}}_{\to 1}\cdot\underbrace{\frac{1}{\cos 2t}}_{\to 1}}$$

$$\to \frac{1}{8} \text{ as } t\to 0.$$

$$\lim_{x \to 0} \left| \operatorname{Arctan}\left(\frac{1}{x}\right) \right| = \frac{\pi}{2}.$$

$\tan x$



$\operatorname{Arctan} x$