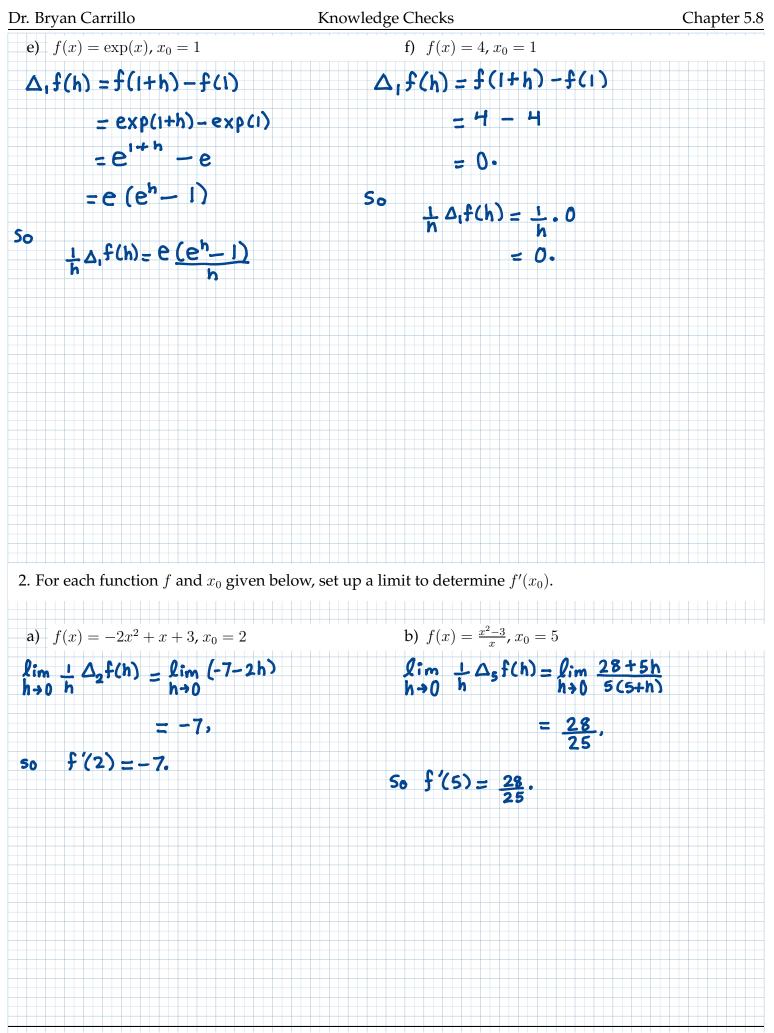
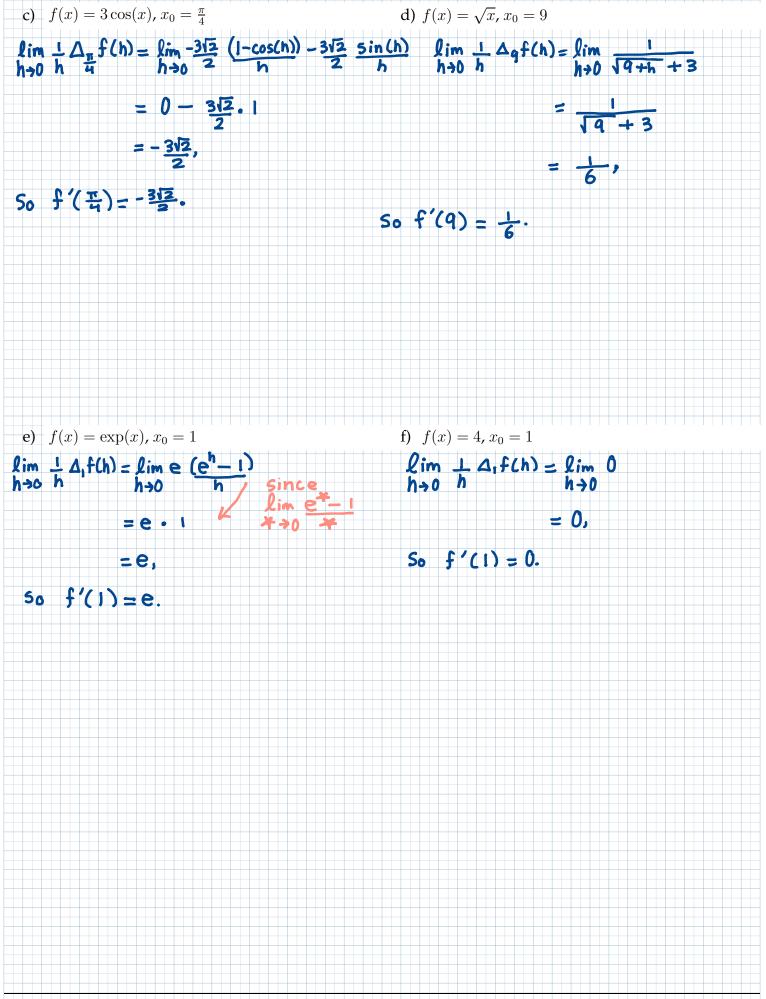
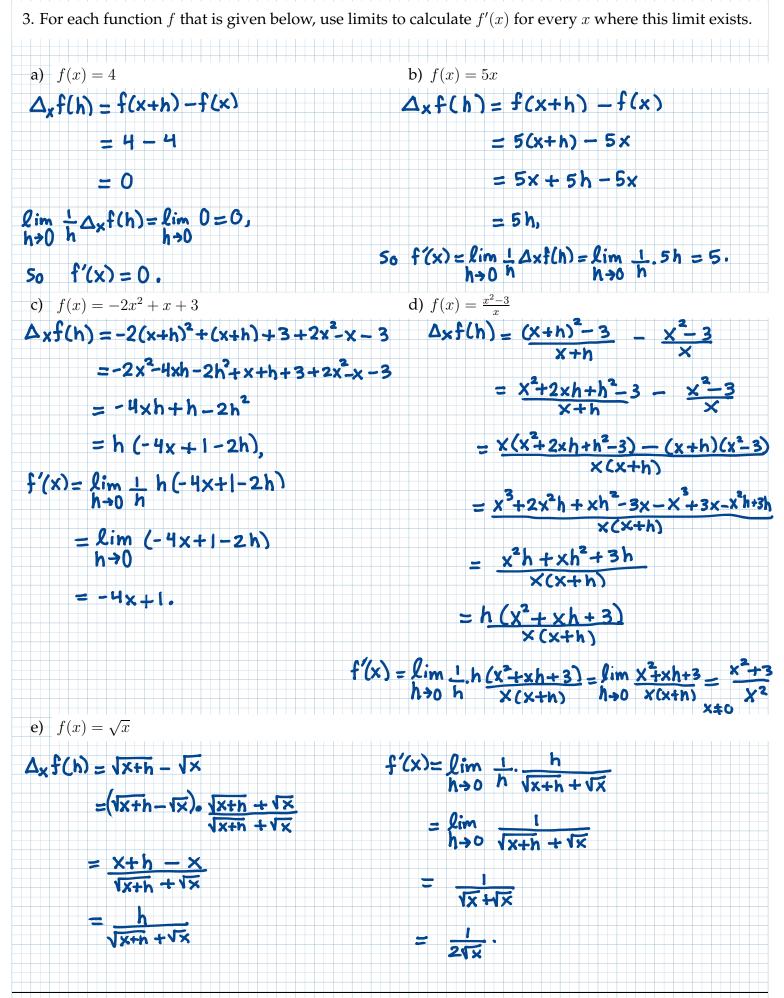


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4. Take f to be the function that is given by

$$f(x) = \cos(5x^2 + 1).$$

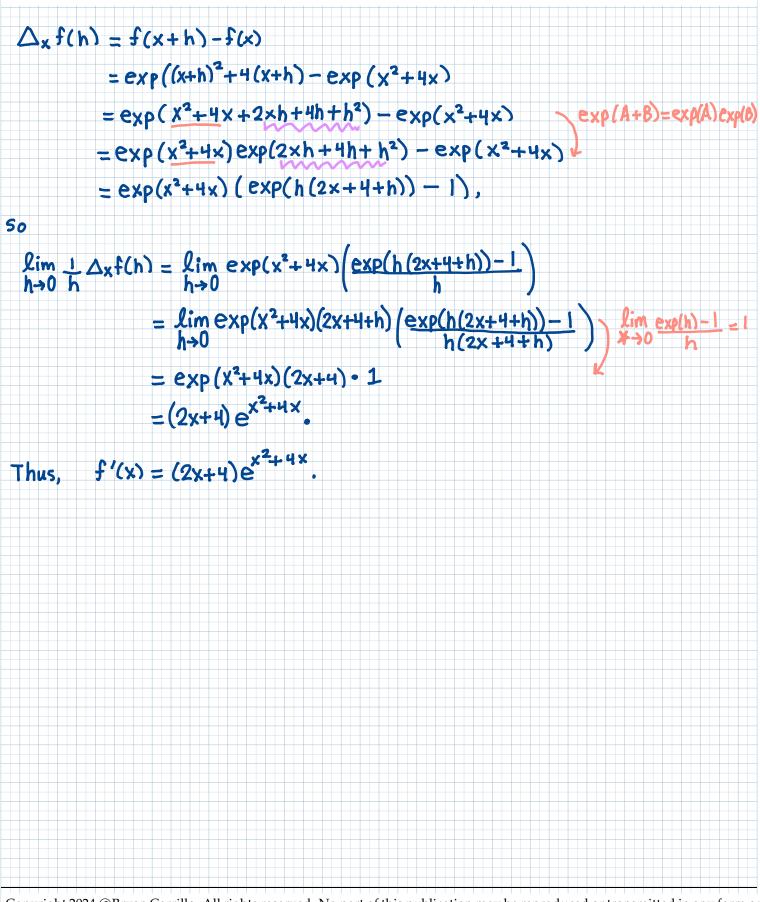
Show that *f* is differentiable for each *x* in \mathbb{R} and determine f'(x).

$$\begin{aligned} \Delta_{x}f(h) &= f(x+h) - f(x) \\ &= cos(5(x+h)^{x} + 1) - cos(5x^{2} + 1) \\ &= cos(5x^{x} + 1 + 10xh+5h^{x}) - cos(5x^{2} + 1) \\ &= cos(5x^{x} + 1) (cos(10xh+5h^{x})) - sin(5x^{x} + 1) sin(10xh+5h^{x}) - cos(5x^{2} + 1) \\ &= -cos(5x^{x} + 1)(1 - cos(10xh+5h^{x})) - sin(5x^{x} + 1) sin(10xh+5h^{x}) , \\ &= -cos(5x^{x} + 1)(\frac{1 - cos(10(xh+5h))}{h}) - sin(5x^{x} + 1) sin(10(xh+5h)) , \\ &= -cos(5x^{x} + 1)(\frac{1 - cos(h(10x+5h))}{h}) = sin(5x^{x} + 1) sin(h(10x+5h)) , \\ &= -cos(5x^{x} + 1)(0x+5h)(\frac{1 - cos(h(10x+5h))}{h}) = sin(5x^{x} + 1) sin(h(10x+5h)) , \\ &= -cos(5x^{x} + 1)(1 - cos(h(10x+5h))) = sin(5x^{x} + 1) sin(h(10x+5h)) , \\ &= -cos(5x^{x} + 1)(1 - cos(h(10x+5h))) = sin(5x^{x} + 1)(10x+5h) , \\ &= -cos(5x^{x} + 1)(10x+5h) f(x + 1 - cos(h(10x+5h))) - sin(5x^{x} + 1)f(x + 1) , \\ &= -cos(5x^{x} + 1)(10x+5h) f(x + 1 - cos(h(10x+5h))) - sin(5x^{x} + 1)f(x + 1) , \\ &= -cos(5x^{x} + 1)(10x+5h) f(x + 1 - cos(h(10x+5h))) - sin(5x^{x} + 1)f(x + 1) , \\ &= 10x sin(5x^{x} + 1). \end{aligned}$$

5. Take f to be the function that is given by

$$f(x) = e^{x^2 + 4x}.$$

Show that *f* is differentiable for each *x* in \mathbb{R} and determine f'(x).



6. Take c to be the path that is given for each t by

$$c(t) = (t^3 - 5t, 6\sin(5t)).$$

Use limits to directly calculate c'(t).

