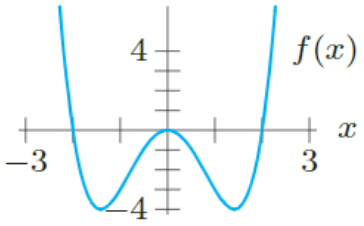
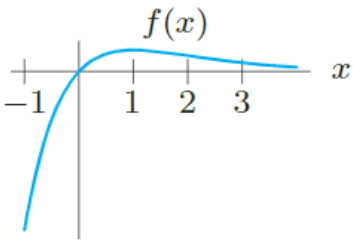
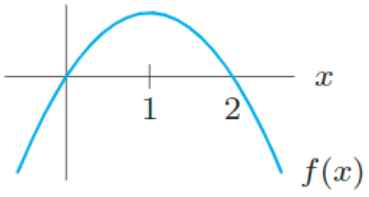
Full name(s): _____ .

Questions

1. Use algebra to evaluate the following limits, interpret them as a derivative:
   - $\lim_{h\to 0} \frac{(3+h)^2-9}{h}$
   - $\lim_{h\to 0} \frac{(2+h)^3-8}{h}$
   - $\lim_{h\to 0} \frac{(2+h)^{-1}-1/2}{h}$
   - $\lim_{h\to 0} \frac{(-1+h)^{-2}-1}{h}$
2. Let k, m be constants. Find the derivative function $\frac{df}{dx}(x)$ for each of the following:
   - $f(x) = kx^3$
   - $f(x) = kx + m$
   - $f(x) = \frac{k}{x}$
   - $f(x) = k$
   - $f(x) = kx^2 + x$
3. Show that the derivative operation is linear, that is if a_1 and a_2 are constants then show that
$$\frac{d}{dx}(a_1 f + a_2 g)(x) = a_1 \frac{df}{dx}(x) + a_2 \frac{dg}{dx}(x) \tag{1}$$
   Assume f and g are differentiable for all x.
4. Estimate the following derivatives:
   - $\sin'(0)$
   - $\tan'(0)$
   - $\ln'(2)$
   - $\frac{d3^x}{dx}(3)$
5. Try to graph the derivative of $\sin(x)$ from the graph of $\sin(x)$. Do so on the same plot.
6. Do the same for each of the following functions:







7. If a car has position $x(t) = .67t^2 + 2t$ meters at t seconds, what is there velocity at $t = 2$?