

B06.

136.150: Test #3
Solutions

Name: _____

Student Number: _____

1. Use the definition of derivative to find the derivative $f'(x)$ of the function $f(x) = x - 1$. No points will be awarded if you do not use the definition of the derivative of a function.

Solution.
$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{(x+h-1) - (x-1)}{h} = \lim_{h \rightarrow 0} \frac{h}{h} = 1$$

2. Compute $f'(x)$. Use the methods/properties that we have covered. Do NOT use the definition. You do not need to simplify your answers but you do need to compute all of the derivatives.

(a) $f(x) = (x^2 - 1)\sin x$

Solution. $f'(x) = (x^2 - 1)' \sin x + (x^2 - 1)(\sin x)' = 2x \sin x + (x^2 - 1) \cos x$

(b) $f(x) = \frac{2^x}{(x+1)}$

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

(c) $f(x) = \cos(\sqrt{x} + 1)$

Solution. $f'(x) = -\sin(\sqrt{x} + 1)[(\sqrt{x} + 1)'] = -\frac{1}{2\sqrt{x}} \sin(\sqrt{x} + 1).$