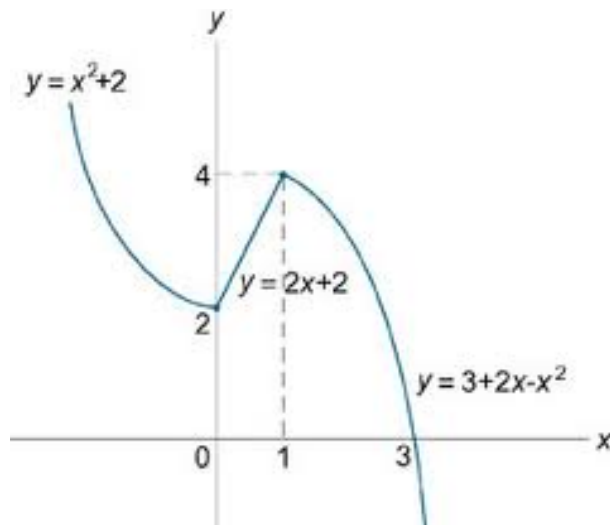


MATH1210: Midterm 2 Practice Exam

The following are practice problems for the first exam. This is not meant to mimic the length of the actual exam. This is likely between 25% and 50% longer than the actual exam.

1. Sketch the graph of the derivative of the following function:



2. Find the equation of the tangent line to $f(x) = x^3 - x$ at $x = 1$. Then sketch the graph of $f(x)$ and the tangent line just calculated. (*Hint:* To sketch the graph, try factoring the polynomial to find its roots)
3. Compute the derivatives of the following functions (at the specified point if asked) directly from the definition:
 - (a) $f(x) = 2x^2 + 3x$
 - (b) $g(x) = 3x - 4$ at $x = 2$
 - (c) $h(x) = \frac{x+1}{x-1}$
 - (d) $i(x) = \sqrt{2x-1}$
4. Directly from the definition, find the derivative of $f(x) = \cos 2x$.
5. Suppose $f(3) = 7$, $f'(3) = -1$, $g(3) = 2$, and $g'(3) = 2$. Find $(f \cdot g)'(3)$.
6. Using the rules for trig derivatives, find $\frac{df}{dx}$
 - (a) $f(x) = \tan^3 x$
 - (b) $f(x) = (\sin x)(\cot x)$
 - (c) $f(x) = \frac{\sin x + \cos x}{\tan x}$

7. Find $f'(x)$ if
- (a) $f(x) = (4 + 2x^2)^7$
 - (b) $f(x) = \frac{x^2 - 9}{x + 4}$
 - (c) $f(x) = (2 - 3x^2)^4(x^7 + 3)^3$
 - (d) $\cos^2(\cos(\cos x))$
 - (e) $\cos^2(\cos(\cos t))$ (not a typo)
8. Suppose $f'(4) = 2$, $g(0) = 4$, and $g'(0) = 3$. Find $(f \circ g)'(0)$.
9. Find f' , f'' , and f''' if
- (a) $f(x) = \sin(3x)$
 - (b) $f(x) = x^4 + 2x^3 + 3x^2 + 4x + 20$
10. Exercise 31 from §2.6
11. Find $D_x y$ using implicit differentiation.
- (a) $x^2 + 2x^2y + 3xy^3 = 0$
 - (b) $x\sqrt{y+1} = xy + 1$
 - (c) $\cos^2(xy) = y^2 + x^2$
12. Exercises 18, 20, and 22 from §2.8