

Calculus 1 — Exam 2
MAT 250, Spring 2015 — D. Ivanšić

Name: _____
Show all your work!

Differentiate and simplify where appropriate:

1. (6pts) $\frac{d}{dx} \left(3x^7 - \frac{5}{x^3} - \sqrt[5]{x^3} - 7c^2 \right) =$

2. (5pts) $\frac{d}{dt} (t^2 + 3) \cos t =$

3. (6pts) $\frac{d}{dx} \frac{2x - 7}{x^2 + 4x - 5} =$

4. (6pts) $\frac{d}{d\theta} (\sec^2 \theta - \tan^2 \theta) =$

5. (7pts) $\frac{d}{dx} (ax + \sqrt{bx^3 - 7x})^5 =$

6. (8pts) Let $g(x) = xf(x)$ and $h(x) = f(x^2)$.

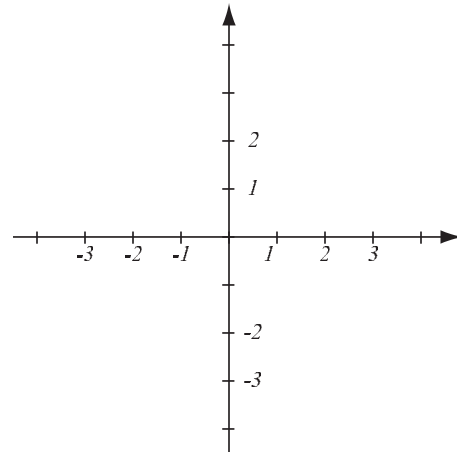
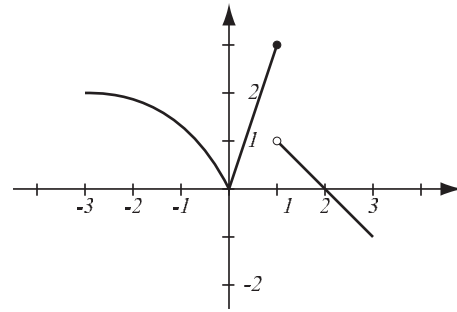
a) Find the general expressions for $g'(x)$ and $h'(x)$.

b) Use the table of values below to find $g'(3)$ and $h'(2)$.

x	1	2	3	4
$f(x)$	7	3	0	1
$f'(x)$	-2	1	-2	3

7. (10pts) The graph of the function $f(x)$ is shown at right.

- Where is $f(x)$ not differentiable?
- Use the graph of $f(x)$ to draw an accurate graph of $f'(x)$.



8. (15pts) Let $f(x) = 3x^2 + 5x - 1$.

- Use the limit definition of the derivative to find the derivative of the function.
- Check your answer by taking the derivative of f using differentiation rules.
- Write the equation of the tangent line to the curve $y = f(x)$ at point $(1, 7)$.

9. (9pts) A snowball is thrown upwards from ground level with initial velocity 20m/s. Its position is given by the formula $s(t) = -5t^2 + 20t$.

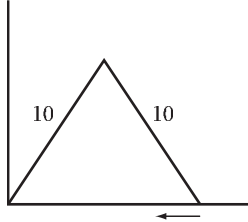
a) Write the formula for the velocity of the snowball at time t .

b) When does the snowball reach its maximum height and what is it?

10. (12pts) Use implicit differentiation to find y' .

$$x^2 + y^2 = \sin x \cos y$$

11. (16pts) A folding ladder whose sides are 10ft long has one end against a wall. If the other end is pushed toward the wall at rate $1/4$ foot per second, how fast is the top of the ladder rising when the pushed end is 6 feet away from the wall?



Bonus. (10pts) The Energizer Bunny moves along a straight road so that his position function is $s(t) = t^3 - 15t^2 + 48t + 2$.

- Find the velocity and acceleration functions and sketch their graphs.
- When is the Bunny moving forward? Backward?
- Use the information you found above to sketch the Bunny's path.
- What is his velocity when acceleration is 0?