SECOND REVIEW SHEET FOR CALCULUS I SKILLS

This is intended as a general review and NOT as a challenge exam to a course.

1. Find the first derivative of a composition of functions.

$$f(x) = \sqrt[3]{\frac{1}{2-3x}}$$

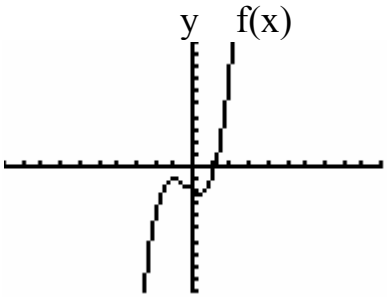
2. Given a polynomial function, find a derivative higher than the first or second.

$$f(x) = 3x^7 - 5x^5 + 3x^4 + 7x^2 - 6x + 3\pi$$
$$Find: \quad f'''(x)$$

3. Given a function, find the SLOPE of the line tangent to the function at a given point (x,y).
   Then write the equation of the tangent line in slope-intercept form.

Function: $f(x) = x^3 - 7x - 2 \quad at \quad x = 4$

4. From the graph of a function, sketch by hand the derivative of the function. Use estimated slopes of lines tangent to the curve at specific points.



5. Given a position function, find the velocity and acceleration at a specific time.

Function: $f(t) = 3t^3 - 40t^2 + 160 \quad at \quad t = 5$

6. When will two objects have the same velocity? The same acceleration?

$$f(t) = 2t^2 + 3$$
$$g(t) = (t^2 + 4)^2$$

7. Given the path of an object, determine intervals of t where the object is advancing, retreating.

$$s(t) = 3t^3 - 40.5t^2 + 162t \quad on \ [0,8]$$

8. Abstract application of derivative laws. No functions given; just function values.
Know product rule, quotient rule, derivative of a composite function.

Given: $f(3) = 1 \qquad f'(3) = -4$
$g(3) = -5 \qquad g'(3) = \ \ 2$

Find: $\left(\dfrac{f}{g}\right)'(3)$

9. Find first derivative of a sum and/or difference of trig functions. Some chain rule involved.

$$f(x) = e^{2x}(\sin x - \cos x) + (2\csc x + \tan x)$$

10. Given the function for the path of an object, determine intervals of t when the object is accelerating, decelerating.

$$s(t) = \frac{1}{2}t^5 - \frac{1}{6}t^3 + \frac{1}{2}t + 2 \quad on \ [-2,5]$$

11. Find the first derivative of a sum and/or difference of "root" functions of x. Uses power rule with fractional exponents.

$$f(x) = 2\sqrt[4]{x^5} + 5\sqrt[4]{x^3} - 4$$

12. Find the first derivative of a composition using ln(x) or e^x.

a). $f(x) = e^{4x^2+2x+3}$

b). $f(x) = \ln\left[\dfrac{4x+2}{3x+7}\right]$

13. Given a trig identity, use either the product or the quotient rule to derive the derivative of the trig function.

Given: $\csc(x) = \dfrac{1}{\sin(x)}$

Use the quotient rule to derive the derivative of $\csc(x)$

14. Use the definition of the derivative to "prove" the derivative of a function.

Use: $\lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$

To "prove" that $\dfrac{d}{dx}(2x^2 + 5x + 7) = 4x + 5$