Important Note: If this is more than a "cobweb removal" exercise for you - if you are really struggling with a lot of these questions - come see me ASAP!!! If your Calc I background is weak, then your success in this course will rely on you coming to see me EARLY and OFTEN!

Question 1. Some specific algebra skills we will need:

- (a) Solve for x in (b) Solve for x in (c) Simplify: $y = \frac{4x - 1}{2x + 3}$ $y = x^{6} - 1$ $\frac{2^{n}}{4^{n-1}}$
- (d) Simplify:

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- (f) Complete the square: $x^2 3x + 5$ (that is, write it in the form $a(something)^2 + constant$)

 $\frac{x^{-2}y^3}{\sqrt{x^5y^{-4}}}$

 $\frac{\frac{(n+1)^2}{3^{n+1}}}{\underline{n^2}}$

(g) One more complete the square: $4x^2 + 5x + 1$

Question 2. You will need to be good friends with trig functions!

- (a) Sketch the graph of each of the six basic trig functions.
- (b) Use the graphs to find $\sin \frac{\pi}{2}$, $\sec 2\pi$, and $\tan(-\pi)$.
- (c) Use a (non-calculator!) method of your choice to evaluate $\sin(-\pi/3), \cos(3\pi/4), \tan(5\pi/3), \cot(-\pi/4), \sec(2\pi/3)$, and $\csc \pi$.
- (d) Evaluate the following limits, if they exist:

$$\lim_{x \to (\pi/2)^+} \tan x \qquad \lim_{x \to \infty} \sin x \qquad \lim_{x \to 0} \cos x$$

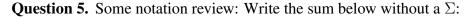
Question 3. You need to know your trig forwards AND backwards...

- (a) Evaluate: $\tan^{-1} 1$, $\arcsin(-\frac{1}{2})$, and $\sec^{-1} \sqrt{2}$
- (b) Sketch the graph of $y = \sin^{-1} x$, $y = \cos^{-1} x$, and $y = \tan^{-1} x$.

Question 4. And who could forget exponential and logarithmic functions?

- (a) Simplify the following:
 - (a) $\ln e^{\sin x}$
 - (b) $\log_2 \frac{1}{8}$
 - (c) $\ln 8 \ln 2$
- (b) Sketch the graph of $y = \ln x$, $y = (\frac{1}{2})^x$, and $y = e^x$.
- (c) Evaluate:

$$\lim_{x \to 0^+} \ln x \qquad \qquad \lim_{x \to 0^+} 2^x$$



$$\sum_{n=1}^{4} \frac{1}{n^2}$$

Question 6. Now on to calculus! For each of the functions f(x) below, find f'(x).

- (a) $f(x) = 3x^4 7x^2 + x 1$
- (b) $f(x) = (2x+7)^{10}$
- (c) $f(x) = 3x\sqrt[3]{1-x}$

(d)
$$f(x) = \frac{x+1}{x^2-7}$$

(e) $f(x) = (2x+2)^4 \sqrt{x+1}$

Question 7. Find y':

- (a) $y = \cos(3x + 2)$
- (b) $y = 5 \tan^2 x$
- (c) $y = \sin x \tan(\frac{1}{x})$
- (d) $y = \frac{\cot x}{1-x^2}$
- (e) $y = \csc(\sin^2(3x))$

Question 8. I know logs and exponentials and inverse trig functions are your favorite... Differentiate the following functions:

- (a) $f(x) = 3^{\log_2 x}$
- (b) $s(t) = (2+5t)e^{-3t}$

- (c) $f(x) = \sin^{-1}(2x+1)$
- (d) $g(x) = x^{1-e}$
- (e) $g(t) = e^{\sin t} (\ln t^2 + 1)$
- (f) $s(t) = e^t \tan^{-1} t^2$
- (g) $f(\theta) = 2^{\sin 5\theta}$
- (h) $h(x) = \log_3(1 + x \ln 3)$

Question 9. Find an equation for the line tangent to the curve $y = 2\cos(2x)$ at x = 0.

Question 10. Evaluate the following limits at infinity. Hint for some (but NOT all!) of them: L'Hopital's rule exists!

- (a) $\lim_{x \to \infty} \frac{3x^9 2x^2 + 1}{2x^9 + 100x^4 x}$
- (b) $\lim_{x\to\infty} \frac{\sin x}{x^2-3}$
- (c) $\lim_{x\to\infty} \frac{e^x}{x^2+1}$
- (d) $\lim_{x\to\infty} \frac{\ln x}{x^2+1}$

Question 11. How about antiderivatives? Find *all* functions F(x) with the given derivative f(x):

- (a) $f(x) = 3x^2 5x + 2$
- (b) $f(x) = 2\sin x \cos x$
- (c) $f(x) = 4e^x + x$
- (d) $f(x) = 2\sqrt{x}$
- (e) $f(x) = \frac{7}{1+x^2}$