Exponential Functions, Natural Logs & L'Hôpital's Rule Review Sheet

Find dy/dx for each:

1) $y = \ln\sqrt{x}$

2) $y = \ln(3x^2 + 6)$

3) $y = 1/e^x$

4) $y = e^{(1 + \ln x)}$

5) $y = \ln(\cos x)$

Evaluate the following integrals:

6) $\int_{-1}^{1} \frac{dx}{3x+4}$

7) $\int_{\ln 3}^{\ln 4} e^x dx$

8) $\int_{0}^{4} \frac{2x dx}{x^2+25}$

9) $\int_{0}^{\ln 3} e^{2x} dx$

10) $\int_{0}^{\pi/4} e^{\tan x} \sec^2 x dx$

Find each of the following limits using l'Hôpital's Rule:

13) $\lim_{x \to 1} \frac{\ln x}{x-1}$

14) $\lim_{x \to -1} \frac{x^2 - 1}{x+1}$

15) $\lim_{x \to -2} \frac{x+2}{x^2+3x+2}$

16) $\lim_{x \to 0} \frac{x + \tan x}{\sin x}$

17) $\lim_{x \to 1} \frac{\ln x}{\sin \pi x}$

Use the Product Rule to find each of the following derivatives:

1) $y = (3x^2 + 6)(2x - \frac{1}{4})$

2) $y = (2 - x - 3x^3)(7 + x^5)$

3) $y = (x + 3)(2 - x^2)$

4) $y = x^3 \ln x$

Use the Quotient Rule to find each of the following derivatives:

5) $y = \dfrac{4x - 1}{2x + 2}$

6) $y = (6 - x)(3 + x^2)^{-1}$

7) $y = \dfrac{e^x}{x + 2}$

8) $y = \dfrac{\sin x}{\cos x}$

Derivatives & Integrals Practice

Find dy/dx for each expression and then take the integral of your answer to check:

1) $y = 3x^2 + x - 7$

2) $y = (x^2 + 2)^3$

3) $y = \sin 2x$

4) $y = -\frac{1}{2} \cos x^2$

5) $y = 2 \ln x^3$

6) $y = 2 e^{3x}$

Evaluate each integral and then take the derivative of your answer to check:

7) $\int (3x^2 - 4x^2 + 5)\, dx$

8) $\int x\,(2x^2 - 5)^2\, dx$

9) $\int (1/3)\sec^2 3x\, dx$

10) $\int -6x^2 \cos x^3 \, dx$

11) $\int e^{(2x+2)} \, dx$

12) $\int \frac{x^2}{x^3+1} \, dx$

MAX/MIN & CONCAVITY Review Sheet

Find all asymptotes, all local min's and max's, all inflection points and where the graph is rising/falling & concave up/concave down.

1) $y = x + \sin x$ in the interval $[-2\pi, 2\pi]$

2) $y = x^3 - 2x^2 + x$

3) $y = 2x^3 - x^2 - 14x - 12$

4) $y = \frac{x^2 - 4}{x - 1}$

Areas & Volumes Review

I - Find the area of the region bounded by the given curves:

1) $y = x^2$, $y = x$

2) $x + y = 0$, $x = y^2 + 3y$

3) $y = \sqrt{x}$, $y = x^2$, $x = 2$

II - Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified line. Sketch the region, the solid, and a typical disk or washer.

4) $y = x^2$, $x = 1$, $y = 0$; about the x-axis

5) $y^2 = x$, $x = 2y$; about the y-axis

6) $y = x^2$, $x = y^2$; about the x-axis

7) Find the volumes of the solids obtained by rotating the region bounded by the curves $y = 4$ and $y = x^2$ about the following lines:

a) the y-axis

b) the x-axis

Derivative/Tangent Line Review

For each of the following:
A) Find the equation of the tangent line for each of the following functions at each given value of x.
B) Draw the graph of the function and the tangent line with your calculator and copy graph.
C) Indicate in your graph the point of intersection between the curve and the tangent line.

1) $y = 3x^2 - 4x + 7$ at $x = 1$

2) $y = -x^2 + 2x - 3$ at $x = 2$

3) $y = -4x^2 + 3$ at $x = 0$

4) $y = 3x^2 - x + 4$ at $x = 0$

5) $y = -x^2$ at $x = 0$

Limits Review

1) $\lim_{x \to 0} \frac{\sin x}{x + 2}$

2) $\lim_{x \to 1} \frac{x - 1}{x^2 - 1}$

3) $\lim_{x \to \infty} \frac{x + 1}{x}$

4) $\lim_{x \to -1} \frac{x + 3}{x^2 + 3x + 1}$

5) $\lim_{x \to -2} \frac{x + 2}{x^2 - 4}$

6) $\lim_{x \to 2} \frac{2x - 4}{x^3 - 2x^2}$

7) $\lim_{x \to 1} \frac{\ln x}{1 - x}$

8) $\lim_{x \to 1} \frac{\ln x}{e^x - e}$

9) $\lim_{x \to 0} \frac{\sin x}{2x^2 - x}$

10) $\lim_{x \to -1} \frac{x^2 - 1}{x}$

11) $\lim_{t \to 1} \frac{t^2 - 3t + 2}{t^2 - 1}$

12) $\lim_{x \to -2} \frac{x + 2}{2^x}$

13) $\lim_{x \to 1} \frac{\ln x}{x^2 - 1}$

Use two methods to find each of the following derivatives:

15) $y = (3x^2 + 6)(2x - \frac{1}{4})$

16) $y = (2 - x - 3x^3)(7 + x^5)$

17) $y = (x + 3)(2 - x^2)$

18) $y = x^3(x + 1/x^2)$