HOMEWORK #20

Review Packet for Exam #3

Due Tuesday April 17 at the beginning of class.

Derivatives Compute each of the following derivatives.

1. y' where $y = x^{\sqrt{x}}$.

2. $f'(x)$ where $f(x) = (\tan x)^x$.

3. $f'(x)$ where $f(x) = 5^x$.

4. $f'(x)$ where $f(x) = \tan(\ln(1+x^2)) + \ln(1+\sec^2 x) + \dfrac{5}{\ln(1+x^2)}$.

5. $f''(x)$, where $f(x) = \dfrac{x^4}{e^x}$. Simplify here.

6. $g''(x)$, where $g(x) = \displaystyle\int_x^{2012} \sqrt{\ln t} + \ln\sqrt{t}\; dt$.

7. $\dfrac{d}{dx} \ln\left(\dfrac{(x^2+1)^{\frac{4}{7}}\, e^{\tan x}}{\sqrt{1+\sqrt{x}}}\right)$ Hint: you might want to simplify before differentiating.

8. $\dfrac{dy}{dx}$, if $\sin y + e^x = \sec x + \cos(e^9) - e^{xy}$.

Integration Compute each of the following integrals.

9. $\displaystyle\int \frac{(3-\sqrt{x})(1+2\sqrt{x})}{x^2}\, dx$

10. $\displaystyle\int_e^{e^3} \frac{4}{x(\ln x)^2}\, dx$

11. $\displaystyle\int_{\frac{\pi}{2}}^{\pi} \frac{\sin x}{e+\cos x}\, dx$

12. $\displaystyle\int_{\ln 3}^{\ln 8} \frac{e^x}{\sqrt{1+e^x}}\, dx$

13. $\displaystyle\int \frac{\sec(e^{-x})\tan(e^{-x})}{e^x}\, dx$

14. $\displaystyle\int \tan(3x)\, dx$

Tangent Lines

15. Find the equation of the tangent line to the curve
$y = \cos(\ln(x+1)) \ + \ \ln(\cos x) \ + \ e^{\sin x} \ + \ \sin(e^x - 1)$ at the point where $x = 0$.

Curve Sketching

16. Let $\boldsymbol{f(x) = \dfrac{x^4}{e^x} = x^4 e^{-x}}$.
For this function, discuss domain, vertical and horizontal asymptote(s), interval(s) of increase or decrease, local extreme value(s), concavity, and inflection point(s). Then use this information to present a detailed and labelled sketch of the curve.

Take my word that $\lim\limits_{x\to\infty} f(x) = 0$ and $\lim\limits_{x\to-\infty} f(x) = +\infty$.

Also take my word that $f'(x) = \dfrac{x^3(4-x)}{e^x}$ and $f''(x) = \dfrac{x^2(x-2)(x-6)}{e^x}$.