Name Instructor

Math 165 Final, Spring 2007

For full credit, all work must be shown. Calculators MAY NOT be used on this portion. You will have 30 minutes to complete problems 1.-10.

In 1.-10., evaluate each expression.

1. (6 pts) $\lim_{x\to\infty} \dfrac{x^2 - 1/x}{7x - 3x^2}$

2. (6 pts) $\frac{d}{dx} 3^{\sqrt{2}x}$

3. (6 pts) $\frac{d}{dx} \sin(x^2 + 5x + 2\pi)$

4. (6 pts) $\frac{d}{dx} \ln(\frac{1}{x})$

5. (6 pts) $\frac{d}{dx} \frac{1}{1+e^x}$

6. (6 pts) $\dfrac{d}{dx}\left(\displaystyle\int_1^{\pi} \sin^2(t)\,dt\right)$

7. (6 pts) $\displaystyle\int_{-\sqrt{3}}^{\sqrt{3}} \frac{1}{1+x^2}\,dx$

8. (6 pts) $\displaystyle\int_{-\pi/2}^{\pi/2} \frac{\sin x}{1+\cos x}\,dx$

9. (6 pts) $\displaystyle\int \frac{x(x+1)^2}{\sqrt{x}}dx$

10. (6 pts) $\displaystyle\int_0^1 x^2(x^3+5)^{2007}\,dx$

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Calculators MAY be used on this portion.

11. (a) (6 pts) Find the derivative (with respect to x) of $y = x^x$.

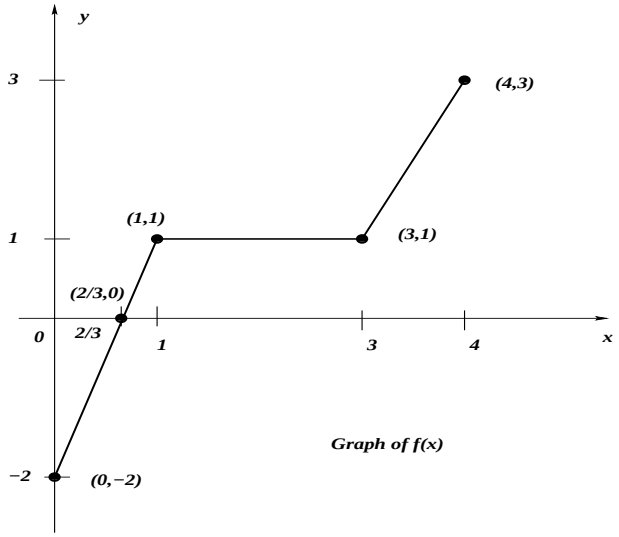
(b) (6 pts) Find the equation for the line tangent to the graph of $y = x^x$ at $(1, 1)$.

12. (12 pts) Write $\lim_{n\to\infty} \sum_{i=1}^{n} \left[\left(1+\frac{2i}{n}\right)\right]^3 \frac{2}{n}$ as a definite integral. Do not evaluate!

13. (12 pts) Let $G(x) = \int_{-2}^{x} \left(e^{-t^2}\right)\, dt$. Determine where G is concave up and where it is concave down.

14. (12 pts) Find two nonnegative numbers whose sum is 20 and so that the first number times the square of the second number is a maximum.

15. (12 pts) Find $\int_0^4 f(x)\,dx$, where f is given by the graph below.



16. (12 pts) Consider the function $f(x) = \ln(e^x - 1) - x$, where $x > 0$. Find the interval(s) on which f is increasing, and find the interval(s) on which f is decreasing.