Math 131 - April 29, 2016

Final's Week Resources

- Blake's office hours (TBA)
- Marie Jose's office hours (TBA)
- Calculus help room
- RPMs

Test Review Problems

1. True/False
   (a) The function $f(x) = e^x$ is the inverse of $g(x) = \ln x$
   (b) $\lim_{x\to 0}(\sin x)/x = 0$
   (c) $f(x) = |x|$ is continuous for all x.
   (d) A function can have two different horizontal asymptotes.
   (e) If $-x^2 \leq f(x) \leq x^4$ for all x in $[-1, 1]$ then $\lim_{x\to 0} f(x) = 0$
   (f) If $f''(c) = 0$ then $x = c$ is an inflection point.
   (g) If $f(x)$ is continuous then it is differentiable.
   (h) If $f(x)$ is differentiable then it is continuous.
   (i) f and g are continuous on $[a, b]$ and $f(x) \geq g(x) \geq 0$, $m \leq f(x) \leq M$. Which are true:
   - $\int_a^b f(x)\, dx \geq 0$
   - $\int_a^b f(x)\, dx \geq \int_a^b g(x)\, dx$
   - $m(b - a) \leq \int_a^b f(x)\, dx \leq M(b - a)$
2. Find the maximum and minimum of $f(x) = x^3 - 6x^2 + 9x + 1$ on $[2, 4]$.
3. Find $\frac{d}{dx}\sin^2(x^2)$
4. What is the slope of the line tangent to $x^2 + 3x^2y^2 + 5y^3 + y = 8$ at the point $(2, 0)$?
5. Find the equation of the line tangent to the curve $y = x^2 + e^x$ at the point $(1, 1 + e)$.
6. A particle's position at time t is $s(t) = \sin 2t$. What is the acceleration at time t?
7. Find the average rate of change of $f(x) = x + 6/x$ on the interval $[1, 3]$.
8. Find where $f(x) = 12/(x^2 + 6x + 12)$ is increasing.
9. Find $\lim_{x\to 0}(e^x - 1 - x)/(\cos x - 1)$
10. Find the minimum of $f(x) = (x^4 + 1/x)e^{-x}$ on the interval $(0, \infty)$.
11. Use a linear approximation of $f(x) = x^{4/3}$ at $a = 1000$ to approximate $(1006)^{4/3}$.
12. The altitude of a triangle is increasing at a rate of 1 cm/min while the area of the triangle is increasing at a rate of 2 cm^2/min. At what rate is the bae of the triangle changing when the altitude is 10 cm and the area is 100 cm^2.

13. Find the anti-derivative of $f(x) = x^3 + \sin x$
14. Find the minimum of $f(x) = x^2 \ln x$ on $[0, 2]$.
15. Let $f(x) = (\ln(1 + 2x))/\cos 3x$. Find $f'(0)$
16. A particle moves on a vertical line so that its y-coordinate at time t is $y = t^3 - 12t + 3$, for $t \geq 0$. When is the particle moving up?
17. Find the equation of the tangent line to the curve $x^3 + y^3 = 6xy$ at the point $(3, 3)$.
18. Find the equation of the tangent line to the curve $y = \sqrt{\sin^2 x + x^2}$ at (π, π)
19. Let $f(x) = e^x/\sin x$. Find where $f'(x) = 0$.
20. Find $\lim_{x\to\infty} \sqrt{3x^2 + 1}/(2x - 4)$
21. Suppose $f'(x) = e^x \sin x$. On the interval $(0, 2\pi)$, where is $f(x)$ concave down?
22. Find $\lim_{x\to 1} x^{1/(1-x)}$
23. What are all the indeterminate forms?
24. Find the inflection points of $f(x) = e^{-2x^2}$.
25. $f(x) = x^{1/x}$. Find $f'(2)$.
26. Find all asymptotes of $f(x) = \frac{x^2-5x+6}{3x^2+4x+1}$
27. A spotlight on the ground shines on a wall 12 meters away. If a man 2 meters tall walks away from the spotlight towards the building at the rate of 1.6 m/s, how fast is the length of his shawdow decreasing when he is 4 m from the building.
28. Find $\lim_{x\to\infty} \ln((x + 1)/(3x))$
29. Find the inverse of $f(x) = (x + 1)/(2x + 1)$
30. Use Riemann sums to compute $\int_0^4 (x+1)\, dx$. Check your solution with the fundamental theorem of calculus.
31. If $\int_0^7 g(x)\, dx = 20$, $\int_4^7 g(x)\, dx = 4$, and $\int_0^1 g(x)\, dx = 7$ then what is $\int_1^4 g(x)\, dx$.
32. Find $\int_0^{\pi/4} \sec^2 x + \cos x\, dx$
33. Approximate $\int_{-4}^4 x^2 - 2x\, dx$ using a right hand sum with $n = 4$.
34. Given theat $f(x) = \int_1^x \frac{1}{t}\, dt$, find $f'(2)$
35. Let $F(x)$ be the antiderivative of $f(x) = 5x^4 - 2x^5$. Suppose $F(0) = 4$. Find $F(1)$.
36. Find $\sum_{k=0}^5 k$
37. Find $\int_1^2 (6x^2 - 4x + 5)\, dx$
38. Write the integral as a limit of Riemann sums: $\int_0^4 (2x^2 + 3)\, dx$
39. Write the integral as a limit of Riemann sums: $\int_1^5 (2x^2 + 3)\, dx$
40. Write the limit as a definite integral: $\lim_{n\to\infty} \sum_{i=1}^n \left(-1 + \frac{3i}{n}\right)^2 \left(\frac{3}{n}\right)$