Math-71 Sections 9, 11, 12

Final Exam Cheat Sheet

Limits

Assume $\lim_{x\to a} f(x) = L$ and $\lim_{x\to a} g(x) = M$, and $c \in \mathbb{R}$:

1. $\lim_{x\to a}[c] = c$
2. $\lim_{x\to a}[x^c] = a^c$
3. $\lim_{x\to a}[f(x) \pm g(x)] = L \pm M$
4. $\lim_{x\to a}[f(x)g(x)] = LM$
5. $\lim_{x\to a}\left[\frac{f(x)}{g(x)}\right] = \frac{L}{M} \quad M \neq 0$

Derivatives

Assume $f(x)$ and $g(x)$ are differentiable and $c \in \mathbb{R}$:

1. $\frac{d}{dx}[c] = 0$
2. $\frac{d}{dx}[x^c] = cx^{c-1}$
3. $\frac{d}{dx}[cf(x)] = cf'(x)$
4. $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$
5. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + f'(x)g(x)$
6. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - g'(x)f(x)}{[g(x)]^2}$
7. $\frac{d}{dx}\left[f\left(u(x)\right)\right] = f'\left(u(x)\right)u'(x)$
8. $\frac{d}{dx}\left[e^x\right] = e^x$
9. $\frac{d}{dx}\left[\ln(x)\right] = \frac{1}{x}$
10. $\frac{d}{dx}\left[\frac{1}{x}\right] = -\frac{1}{x^2}$

Optimization

	< 0	> 0
$f'(x)$	decreasing	increasing
$f''(x)$	concave down	concave up

Lagrange Multiplier

$$f_x = \lambda g_x$$
$$f_y = \lambda g_y$$
$$g(x, y) = 0$$

Interest

1. $A = P(1 + rt)$
2. $A = P\left(1 + \frac{r}{n}\right)^{nt}$
3. $A = Pe^{rt}$

Probability

1. $p(x) = \dfrac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$
2. 68–95–99.7 rule

Integrals

1. $\displaystyle\int k dx = kx + C$
2. $\displaystyle\int x^k dx = \frac{1}{k+1} x^{k+1} + C$
3. $\displaystyle\int kf(x)dx = k \int f(x)dx$
4. $\displaystyle\int [f(x) \pm g(x)]dx = \int f(x)dx \pm \int g(x)dx$
5. $\displaystyle\int e^x dx = e^x + C$
6. $\displaystyle\int \frac{dx}{x} = \ln(x) + C$
7. $\displaystyle\int_a^a f(x)dx = 0$
8. $\displaystyle\int_a^b f(x)dx + \int_b^c f(x)dx = \int_a^c f(x)dx = 0$
9. $\displaystyle\int_a^b f(x)dx = -\int_b^a f(x)dx$