Cheat Sheet – Exam 2

Derivatives

1. $\frac{d}{dx}(\tan x) = \sec^2 x$

2. $\frac{d}{dx}(\cot x) = -\csc^2 x$

3. $\frac{d}{dx}(\sec x) = \sec x \tan x$

4. $\frac{d}{dx}(\csc x) = -\csc x \cot x$

5. $\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$

6. $\frac{d}{dx}(\cos^{-1} x) = -\frac{1}{\sqrt{1-x^2}}$

7. $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$

8. $\frac{d}{dx}(\cot^{-1} x) = -\frac{1}{1+x^2}$

9. $\frac{d}{dx}(\sec^{-1} x) = \frac{1}{x\sqrt{x^2-1}}$

10. $\frac{d}{dx}(\csc^{-1} x) = -\frac{1}{x\sqrt{x^2-1}}$

11. $\frac{d}{dx}(\sinh x) = \cosh x$

12. $\frac{d}{dx}(\cosh x) = \sinh x$

Integrals

13. $\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \sin^{-1}\left(\frac{x}{a}\right) + C$

14. $\int \frac{1}{a^2+x^2}\,dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$

15. $\int \frac{1}{x\sqrt{x^2-a^2}}\,dx = \frac{1}{a}\sec^{-1}\left(\frac{x}{a}\right) + C$

16. $\int \ln x\,dx = x\ln x - x + C$

17. $\int \tan x\,dx = \ln|\sec x| + C$

18. $\int \sec x\,dx = \ln|\sec x + \tan x| + C$

19. $\int \cot x\,dx = -\ln|\csc x| + C$

20. $\int \csc x\,dx = \ln|\csc x - \cot x| + C$

21. $\int \sec^3 x\,dx = \frac{\sec x \tan x}{2} + \frac{\ln|\sec x + \tan x|}{2} + C$

Trig Identities

22. $\sin^2 x + \cos^2 x = 1$

23. $1 + \tan^2 x = \sec^2 x$

24. $1 + \cot^2 x = \csc^2 x$

25. $\sin 2x = 2\sin x \cos x$

26. $\cos 2x = \cos^2 x - \sin^2 x$

27. $\sin A \cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)]$

28. $\cos A \cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)]$

29. $\sin A \sin B = \frac{1}{2}[\cos(A-B) + \cos(A+B)]$

Right Angle Trigonometry

30. $\sin\theta = \frac{opp}{hyp}$ $\qquad \csc\theta = \frac{hyp}{opp}$

31. $\cos\theta = \frac{adj}{hyp}$ $\qquad \sec\theta = \frac{hyp}{adj}$

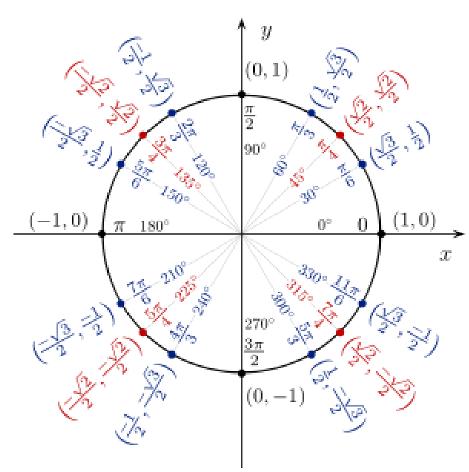
32. $\tan\theta = \frac{opp}{adj}$ $\qquad \cot\theta = \frac{adj}{opp}$

Half-Angle Formulas

33. $\sin^2 x = \frac{1}{2}(1 - \cos 2x)$

34. $\cos^2 x = \frac{1}{2}(1 + \cos 2x)$

	0	π/6	π/4	π/3	π/2
sin *x*	0	$1/2$	$\sqrt{2}/2$	$\sqrt{3}/2$	1
cos *x*	1	$\sqrt{3}/2$	$\sqrt{2}/2$	$1/2$	0
tan *x*	0	$1/\sqrt{3}$	1	$\sqrt{3}$	Undef.



7.1 Integration by Parts

$$\int udv = uv - \int vdu$$

7.3 Trig Substitution

$\sqrt{a^2 - x^2}$	$x = a\sin\theta$	$1 - \sin^2\theta = \cos^2\theta$
$\sqrt{a^2 + x^2}$	$x = a\tan\theta$	$1 + \tan^2\theta = \sec^2\theta$
$\sqrt{x^2 - a^2}$	$x = a\sec\theta$	$\sec^2\theta - 1 = \tan^2\theta$

Parametric Equations

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} \qquad \frac{d^2y}{dx^2} = \frac{\frac{d}{dt}\left(\frac{dy/dt}{dx/dt}\right)}{dx/dt}$$

Area between curve and x-axis:

$$\int_\alpha^\beta ydx = \int_\alpha^\beta g(t)f'(t)dt$$

Arc Length: $L = \int_\alpha^\beta \sqrt{\left(dx/dt\right)^2 + \left(dy/dt\right)^2}\,dt$

Polar Equations

$$x = r\cos\theta \qquad r^2 = x^2 + y^2$$

$$y = r\sin\theta \qquad \tan\theta = \tfrac{y}{x}$$

$$\frac{dy}{dx} = \frac{\frac{dr}{d\theta}\sin\theta + r\cos\theta}{\frac{dr}{d\theta}\cos\theta - r\sin\theta}$$

Area inside the curve: $\int_\alpha^\beta \tfrac{1}{2}r^2 d\theta$

Area between curves: $\int_\alpha^\beta \tfrac{1}{2}\left(r_1^2 - r_2^2\right)d\theta$

Arc Length: $L = \int_\alpha^\beta \sqrt{\left(\tfrac{dr}{d\theta}\right)^2 + r^2}\,d\theta$

Function

Arc Length: $L = \int_a^b \sqrt{1 + \left(\tfrac{dy}{dx}\right)^2}\,dx$