CHAPTER 3 EXAM

Name:

Instructions. Solve the following N problems and write your solutions clearly, showing all work necessary for your solutions. A correct solution without supporting work may receive little or no credit. Clearer work will generally earn more points than work that is hard to read. Solutions do not need to be simplified (I don't expect you to calculate $13600(9.8)$ or $17^{3/2}$; those are perfectly good numbers as written). Calculators, notes, cell phones, and other other materials are not permitted. Additional scratch paper is available at the front of the class.

Definition. The **derivative** of $f(x)$ is $f'(x) = \lim_{h\to 0} \dfrac{f(x+h) - f(x)}{h}$.

Theorem (Differentiation formulas)**.**

1. $\left(f^{-1}\right)'(b) = \dfrac{1}{f'\left(f^{-1}(b)\right)}$
2. $\dfrac{d}{dx}(\tan x) = \sec^2 x$
3. $\dfrac{d}{dx}(\sec x) = \sec x \tan x$
4. $\dfrac{d}{dx}(\cot x) = -\csc^2 x$
5. $\dfrac{d}{dx}(\csc x) = -\csc x \cot x$
6. $\dfrac{d}{dx}\left(\sin^{-1} x\right) = \dfrac{1}{\sqrt{1-x^2}}$
7. $\dfrac{d}{dx}\left(\cos^{-1} x\right) = -\dfrac{1}{\sqrt{1-x^2}}$
8. $\dfrac{d}{dx}\left(\tan^{-1} x\right) = \dfrac{1}{1+x^2}$
9. $\dfrac{d}{dx}\left(\sec^{-1} x\right) = \dfrac{1}{|x|\sqrt{x^2-1}}$

Theorem (Geometry)**.**

1. The volume of a shpere with radius r: $V = \dfrac{4}{3}\pi r^3$
2. The volume of a cylinder with radius r and height h: $V = \pi r^2 h$
3. The volume of a cone with radius r and height h: $V = \dfrac{1}{3}\pi r^2 h$

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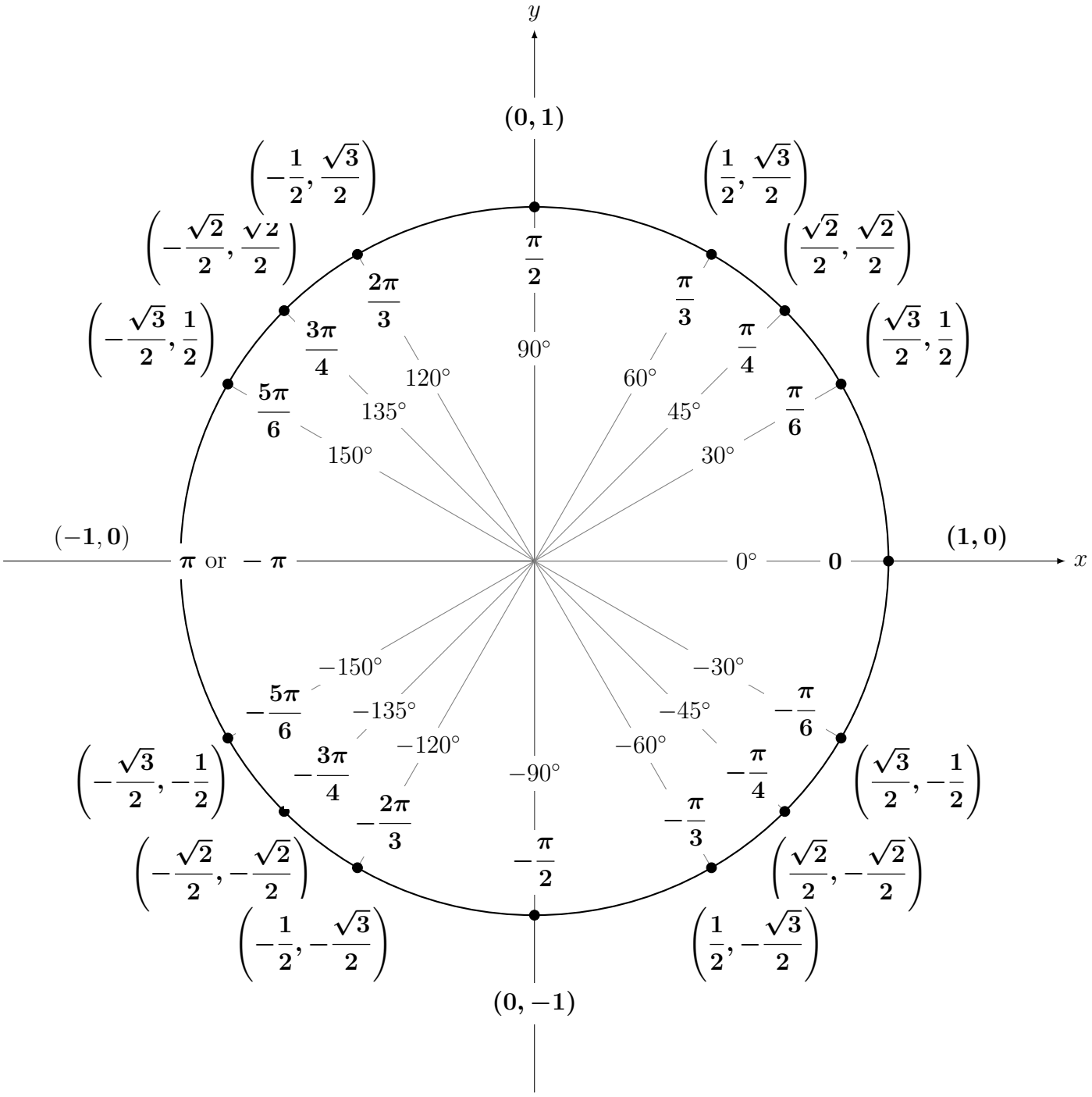
y
(0, 1)
(−1/2, √3/2)
(1/2, √3/2)
(−√2/2, √2/2)
(√2/2, √2/2)
(−√3/2, 1/2)
(√3/2, 1/2)
2π/3
π/3
3π/4
π/4
5π/6
π/6
90°
120°
60°
135°
45°
150°
30°
(−1, 0)
π or −π
0°
0
(1, 0)
x
−150°
−30°
−5π/6
−135°
−45°
−π/6
−120°
−60°
−3π/4
−π/4
−90°
−2π/3
−π/3
−π/2
π/2
(−√3/2, −1/2)
(√3/2, −1/2)
(−√2/2, −√2/2)
(√2/2, −√2/2)
(−1/2, −√3/2)
(1/2, −√3/2)
(0, −1)