Math 141 - Homework 12 **Name:** _____

Calculate the following limits. You can use L'Hospital's rule if it is appropriate.

1. $\lim_{x\to 4} \dfrac{x^2-16}{x-4}$

2. $\lim_{x\to a} \dfrac{x-a}{x^n-a^n}$

3. $\lim_{x\to 4} \dfrac{x^2-16}{x+4}$

4. $\lim_{x\to \pi} \dfrac{\cos(x/2)}{x-\pi}$

5. $\lim_{x\to \infty} \dfrac{x^2}{5x+\sqrt{x}}$

6. $\lim_{h\to \infty} \dfrac{6x^5-3x^4+7x}{5x^5+16x^3-9x^2}$

Calculate the antiderivates of the following functions.

7. $f(x) = 4x^3 + 3x^2$

8. $f(x) = \sec^2 x + \cos x$

9. $f(x) = 10x^4 - 5$

10. $f(x) = \sqrt{x} + 1$

11. $f(x) = \dfrac{1}{x^2}$

12. $f(x) = \dfrac{5}{\sqrt{x}}$

13. $f(x) = 0$

14. $f(x) = \dfrac{x^5 + x^3}{x^2}$

15. $f(x) = x^{-1/3} + x^{1/3}$.

16. Find a function $f(x)$ such that $f'(x) = 4x$ and $f(1) = 5$.

17. Solve the initial value problem $\dfrac{dy}{dx} = \cos x + \sin x$ with $y(0) = 3$.

18. Find the horizontal asymptotes of $f(x) = \dfrac{4x}{\sqrt{x^2 + 3}}$ by calculating the limits as x approaches $+\infty$ and $-\infty$, then sketch a graph of the function. Hint: This function is always increasing because its derivative $f'(x) = 12(x^2 + 3)^{-3/2}$ is always positive.