1. Find the value of $\cos(\arctan(\frac{1}{\sqrt{3}}))$. As part of your solution, include the corresponding right angle triangle(s).

2. Find the value of the constant a such that $\lim_{x\to 0} \frac{\sqrt{9x+a}-3}{x} = \frac{3}{2}$ using L'hospital's Rule. You may assume the conditions in L'hospital's Rule holds.

3. Suppose you are writing an exam and you cannot remember whether the derivative of $\arcsin(x)$ is $\frac{1}{\sqrt{x^2-1}}$ or $\frac{1}{\sqrt{1-x^2}}$. Explain how to use the domain of $\arcsin(x)$ to eliminate one of these possibilities.

4. Use L'Hospital's Rule to evaluate $\lim_{x\to 0} \frac{\arctan(x^2)}{x \arcsin(x)}$ if it exists. If the limit does not exist, explain why.

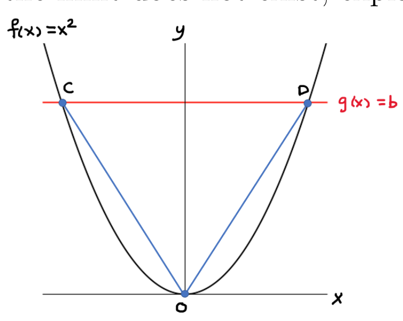
5. Determine the value of $\sin(\arctan(3)+\arctan(2))$ using the trig identity $\sin(A+B) = \sin(A)\cos(B)+\cos(A)\sin(B)$. As part of your solution, include the corresponding right angle triangle(s).

6. Evaluate $\lim_{x\to -\infty} x \ln\left(1+\frac{1}{x}\right)$ using L'hospital's rule if the limit exists. If the limit does not exist, explain why.

7. Evaluate $\int_a^b \frac{e^x}{1+e^{2x}}dx$ using an appropriate substitution.

8. Suppose f is a differentiable function, $f(a) = 0$ and $f'(a) \neq 0$. Find $\lim_{x\to a} \frac{\int_a^x f(t)dt}{f(x)}$ if it exists. If the limit does not exist, explain why.

9. For b a positive constant, let $A(b)$ be the area of the region enclosed by $f(x) = x^2$ and $g(x) = b$. Let $T(b)$ be the area of the triangle COD as shown in the figure. Find $\lim_{b\to 0} \frac{T(b)}{A(b)}$ if it exists. If the limit does not exist, explain why.



10. Let a be a positive constant. Evaluate $\lim_{x\to\infty} x(a^{1/x}-1)$ if the limit exists. If the limit does not exist, explain why.

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