

MATH 253 WORKSHEET WEEK 3

This does **not** count for marks.

1. $\cot(\cot^{-1}(-17\pi/3)) =$

a $-17\pi/3$.

b $17\pi/3$.

c $\pi/3$.

d $-\pi/3$.

e Does not exist.

2. $\tan(\tan^{-1}((13\pi/4))) =$

a $-\pi/4$.

b $\pi/4$.

c Does not exist.

d $-13\pi/4$.

e $13\pi/4$.

3. $\cosh(-\ln(2)) =$

a $-5/4$.

b $5/4$.

c $2/3$.

d $-2/3$.

e 2 .

4. $\csc h(1) =$

a $\frac{e^2-1}{e}$.

b $\frac{e^2-1}{2e}$.

c $\frac{e}{e^2-1}$.

d $\frac{2e}{e^2-1}$.

e 0.

5. If $\tanh(x) = \frac{3}{4}$ then $x =$ (**Hint:** $\tanh^{-1}(x) = \frac{1}{2} \ln\left(\frac{1+x}{1-x}\right)$)

a $\ln\left(\frac{1}{7}\right)$.

b $\ln(\sqrt{7})$.

c $\ln(49)$.

d 1.

e No real solution.

6. If $\cosh(x) = -1$ then $x =$ (**Hint:** $\cosh^{-1}(x) = \ln(x + \sqrt{x^2 - 1})$).

a 0.

b π .

c No real solution.

d -1.

e 1.

7. Find and simplify the derivative of $f(x) = \tanh^{-1}(\sin(x)) + \tan^{-1}(\sinh(x))$.

8. Find and simplify the derivative of $f(x) = x \sinh^{-1}(x) - \sqrt{1+x^2}$ (**Hint:**

$$\sinh^{-1}(x) = \ln(x + \sqrt{x^2 + 1}).$$

9. Find $\int \sin^3(\theta) \cos^2(\theta) d\theta$.

10. Find $\int \frac{\sec^2(\theta)}{\tan^3(\theta)} d\theta$.

11. If ϕ is a differentiable function, find $\lim_{n \rightarrow \infty} \left(\int_0^1 nt^{n-1} \phi(t) dt \right)$.

12. If $I_n = \int_0^\infty \frac{1}{(1+x^2)^n} dx$, find a relationship between I_n and I_{n+1} and then find I_n by induction. Using that result, find $\int_{-\infty}^\infty \frac{e^{3x}}{(1+e^{2x})^2} dx$.