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Worksheet 3, Math 10560

Times indicate the amount of time that you would be expected to spend on the problem in on an exam.

1. (4 min) Evaluate
$$\int \frac{2^x}{\sqrt{1-4^x}} dx$$

2. (4 min) Evaluate the limit
$$\lim_{x\to\infty} \frac{x^2}{e^x}$$

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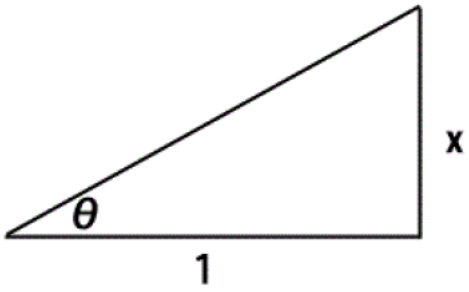
3. (2-3 mins) Evaluate the expression $\arcsin\left(\sin\left(\frac{3\pi}{4}\right)\right)$

4. (2-3 mins) Use the shown triangle to express $\cos(\tan^{-1}(x))$ as a function of x not involving trignometric operations.



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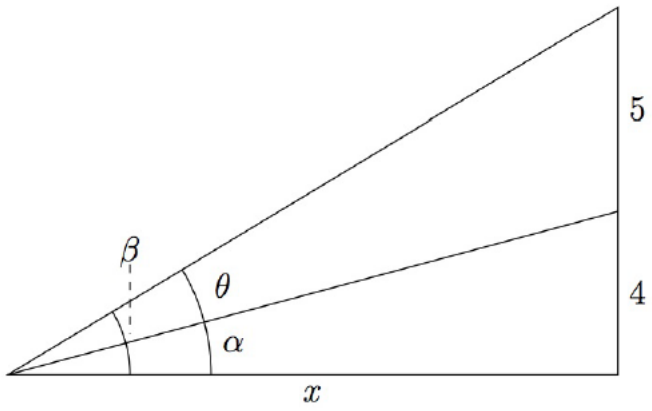
5. (7 mins) Evaluate the limit

$$\lim_{x \to 0} (\cos x)^{1/x^2}$$

6. (Extra Problem) A painting in an art gallery has height 5 ft. and is hung so that its lower edge is a distance 4 ft. above the eye of an observer (see the figure) standing distance x from the all. θ is the angle subtended at the observer's eye by the painting.



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(a) Rewrite θ in terms of α and β.

(b) Use inverse trig functions to write α and β in terms of x.

(c) Combining (a) and (b) together, write θ as a function of x.

(d) How far should the observer stand from the wall to get the best view? In other words, how far should the observer stand to *maximize* the angle θ subtended at his eye by the painting (as shown in the diagram).