Provide both a clear and organized presentation. Show all of your work, give exact values only, and completely simplify all answers. No graphing calculator, not any other electronic device may be used during this exam other than a scientific calculator.

1.   (15 pts) Evaluate the integral $\int \left(\dfrac{\sqrt{2-x^2}}{x} + 1 \right) dx$

2. (20 pts) Evaluate the integral $\displaystyle\int \frac{x^2+1}{x^4-4x^3+6x^2-8x+8}\,dx$

3.   (15 pts) Evaluate the integral $\int \dfrac{\sin^5 x}{1+\cos x}\,dx$

4.   (15 pts) Evaluate the integral $\int x^3 \tanh^{-1} x\, dx$

5.   (15 pts) Evaluate the integral $\int \ln\left(1-\sqrt{x+2}\right)dx$

6.   (10 pts) The following is a concrete wall that measures 20 m by 10 m that is the wall of a water tank. At the bottom center is a window for viewing what is inside.

The window is in the shape of the secant function and has a width of $\frac{\pi}{3}$ m at its top. Determine, but do not evaluate, an integral that represents the force due to hydrostatic pressure on the window portion of this wall. Assume that this concrete wall holds back water that is filled to its top.

20 m

10 m $\frac{\pi}{3}$ m
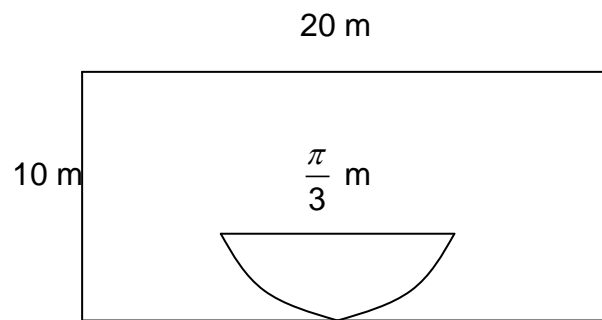
7. (10 pts) A water trough has a front face that is the shape of a trapezoid. It has a closed top and a spout that reaches ½ meter above its top that is not depicted in the picture. If the trough is filled to half its height with water, then determine, but do not evaluate, an integral that represents the amount of work required to pump the water out through the spout that is on top of the trough.