NAME (please print legibly): ____________________________________________
Your University ID Number: __________________________________________
Circle your Instructor’s Name along with the Lecture Time:

Caulk (9 o’clock)  Knightly (10 o’clock)  Moustafaev (2 o’clock)  Qiu (2 o’clock)

• No calculators are allowed on this exam.

• Please show all your work. You may use back pages if necessary. You may
  not receive full credit for a correct answer if there is no work shown.

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1. (12 pts) Find \( F'(x) \) for \( F \) as given:

(a) \( F(x) = \int_{-2}^{x} \sqrt{t^2 - 2t + 5} \, dt \)

ANSWER: ____________________________

(b) \( F(x) = \int_{0}^{x^3} \sec t \, dt \)

ANSWER: ____________________________
2. (12 pts) Evaluate the following integrals.

(a) $\int 1 \, dx$

(b) $\int_{-\pi/2}^{\pi/2} \sin^7 x \, dx$

(c) $\int \tan x \, dx$

ANSWER: ____________________________

ANSWER: ____________________________

ANSWER: ____________________________
3. (16 pts) Find the area of the region(s) bounded by the given functions:

(a) \( f(x) = x^2 - 4x + 3 \)
    \( g(x) = -x^2 + 2x + 3. \)

(b) \( y = x^3 - 2x \)
    \( y = 2x. \)

ANSWER: ______________
4. **(10 pts)** Find the volume of the solid obtained by rotating the region bounded by the curve $y = x^2$ and the line $y = x$ around the horizontal line $y = -1$.

**ANSWER:** __________________________
5. (10 pts) Find the volume of the solid obtained by rotating the region bounded by the following four lines:

the \( x \)-axis, \( y = x \), \( y = x - 2 \), and the horizontal line \( y = 1 \),

around the \( x \)-axis.

ANSWER: ______________
6. (12 pts) A cylindrical well is 12 feet deep with a radius of 3 feet. The well contains 9 feet of water, measured from the bottom. How much work is required to pump all of the water up to ground level?

(Recall that water weighs 62.5 lbs/ft^3.)

ANSWER: _________________
7. (8 pts) The wavelength of light emitted by supernova at time $t$ is

$$w(t) = \frac{t^2 + 1}{t^2} \text{ nanometers.}$$

Find the average wavelength between $t = 1/2$ and $t = 2$. 

ANSWER: ________________________


8. (8 pts) Evaluate the following integrals.

(a) \( \int_{0}^{1} x \sqrt{1-x^2} \, dx \)

(b) \( \int t \sqrt{t-4} \, dt \)
9. (12 pts) Evaluate the following integrals.

(a) \( \int x e^{-2x} \, dx \)

(b) \( \int \ln x \, dx \)

ANSWER: __________________________