Name_____

MATH 172   Exam 2   Spring 2020

Sections 501   P. Yasskin

   Multiple Choice: (Points indicated. No part credit.)

1. $\left(1\text{ points}\right)$ An Aggie does not lie, cheat or steal or tolerate those who do.
   True   ☐   False   ☐

2. $\left(1\text{ points}\right)$ Each answer is one of the following:
      a rational number in lowest terms, e.g. $-\dfrac{217}{5}$ which is entered as "-217/5"
      a rational number in lowest terms times π, e.g. $\dfrac{217}{5}\pi$ which is entered as "217/5pi"
      positive infinity, ∞, which entered as "infinity"
      negative infinity, $-\infty$, which entered as "-infinity"
      convergent, which entered as "convergent"
      divergent, which entered as "divergent"
   Do not leave any spaces. Do not use decimals.
   I read this.
   True   ☐   False   ☐

3. $\left(5\text{ points}\right)$ Compute $\displaystyle\int_0^1 \frac{1}{1-x^2}\,dx$. If divergent, enter "infinity" or "-infinity".

   a. $-\infty$
   b. -1
   c. 0
   d. 1
   e. ∞

1-2	/ 2	14	/16
3-12	/50	15	/16
13	/21	Total	/105

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4. $\left(5\ \text{points}\right)$ Compute $\displaystyle\int_1^\infty \frac{1}{1+x^2}\,dx$. If divergent, enter "infinity" or "-infinity".

   a. 0

   b. $\frac{\pi}{4}$

   c. $\frac{\pi}{2}$

   d. π

   e. ∞

5. $\left(5\ \text{points}\right)$ Compute $\displaystyle\int_{-3}^{3} \frac{1}{x^4}\,dx$. If divergent, enter "divergent".

   a. $\frac{-2}{81}$

   b. $\frac{2}{81}$

   c. $\frac{-1}{81}$

   d. $\frac{1}{81}$

   e. divergent

6. $\left(5\ \text{points}\right)$ What is the **total** number of coefficients in the general partial fraction expansion of

$$\frac{x^5 + x^4}{(x-2)(x-3)^3(x^2+4)^4}$$

For example $\dfrac{Bx+C}{(x^2+9)^3}$ has 2 coefficients.

   a. 4

   b. 7

   c. 8

   d. 12

   e. 16

7. (5 points)   The base of a solid is the region between $y = x^2$ and $y = 2x$. The crosssectons perpendicular to the x axis are squares. Find its volume.

   a. $\dfrac{16}{5}\pi$

   b. $\dfrac{64}{15}\pi$

   c. $\dfrac{32}{15}$

   d. $\dfrac{16}{15}$

   e. $\dfrac{8}{3}\pi$

8. (5 points)   The region between $y = x^2$ and $y = 2x$ is rotated about the x axis. Find the volume.

   a. $\dfrac{16}{5}\pi$

   b. $\dfrac{64}{15}\pi$

   c. $\dfrac{32}{15}$

   d. $\dfrac{16}{15}$

   e. $\dfrac{8}{3}\pi$

9. (5 points)   The region between $y = x^2$ and $y = 2x$ is rotated about the y axis. Find the volume.

   a. $\dfrac{16}{5}\pi$

   b. $\dfrac{64}{15}\pi$

   c. $\dfrac{32}{15}$

   d. $\dfrac{16}{15}$

   e. $\dfrac{8}{3}\pi$

10. $\left(5 \text{ points}\right)$ Duke Skywater just arrived on the planet Corona. He measured that it takes 36 J of work to lift a 2 kg weight by 6 m. What is the acceleration of gravity on the surface of Corona? (Do not enter units.)

a. $2 \dfrac{m}{sec^2}$

b. $3 \dfrac{m}{sec^2}$

c. $12 \dfrac{m}{sec^2}$

d. $48 \dfrac{m}{sec^2}$

e. $72 \dfrac{m}{sec^2}$

11. $\left(5 \text{ points}\right)$ A 200 foot chain weighs $\delta = 2 \dfrac{lb}{foot}$. It is hanging from the top of a 200 foot tall building. How much work is done to pull it up to the top of the building?

a. 5000

b. 10000

c. 20000

d. 40000

e. 80000

12. $\left(5 \text{ points}\right)$ A weight is attached to a spring whose rest position is at $x_o = 3$ m. It takes 24 N of force to hold the weight at $x = 7$ m. How much work (in Joules) is needed to stretch the weight from $x = 6$ m to $x = 9$ m? (The answer is positive. Do not write the units.)

a. 18 J

b. 27 J

c. $\dfrac{81}{2}$ J

d. 54 J

e. 81 J

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13. $(21\ \text{points})$ An oil tank is a cylinder 3 m in radius and 6 m long. Its axis is horizontal. It is filled to a depth of 4 m above the **bottom** of the tank. How much work is done to pump the oil out a spout which is 2 m above the **top** of the tank. Take the density of oil and to be δ and the acceleration of gravity to be g (no numbers for δ and g).

a. Where should you put the 0 of the y-axis? Take y to be positive upward.
  i. at the spout
  ii. at the top of the tank
  iii. at the center of the tank
  iv. at the bottom of the tank

Set up the integral for the work. It will have the form:

$$W = \boxed{\text{b}}\,\delta g \int_{\boxed{\text{c}}}^{\boxed{\text{d}}} \left(\boxed{\text{e}} - y \right)\left(\boxed{\text{f}} - y^2 \right)^{\boxed{\text{g}}} dy$$

Identify each of the quantities in boxes:

b. coefficient: $b =$

c. lower limit: $c =$

d. upper limit: $d =$

e. coefficient: $e =$

f. coefficient: $f =$

g. exponent: $g =$

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Work Out: (Points indicated. Part credit possible. Show all work.)

14. $\left(16 \text{ points}\right)$ Find the coefficients in the partial fraction expansion:

$$\frac{x^3 + 24x^2 - 4x}{(x-2)(x+2)(x^2+4)} = \frac{A}{x-2} + \frac{B}{x+2} + \frac{Cx+D}{x^2+4}$$

15. $\left(16 \text{ points}\right)$ Given the partial fraction expansion

$$\frac{-50x}{(x^2+1)(x+3)^2} = \frac{4}{x+3} + \frac{15}{(x+3)^2} + \frac{-4x-3}{x^2+1}$$

Compute $\displaystyle\int \frac{-50x}{(x^2+1)(x+3)^2}\, dx.$