Name _____ **Hour** _____

AP Calc Chapter 6 Review

1. Evaluate the indefinite integral.

$\int \frac{3}{4x}\,dx =$ $\frac{3}{4}\ln|x|+C$

$\int \sin x + \pi\,dx$ $-\cos x + \pi x + C$

$\int \frac{4}{\sqrt{1-x^2}} + \sec^2 x\,dx =$ $4\sin^{-1}(x) + \tan x + C$

$\int x^2\sqrt{x-2}\,dx =$ $\frac{2}{7}(x-2)^{7/2} + \frac{8}{5}(x-2)^{5/2} + \frac{8}{3}(x-2)^{3/2} + C$

2. Evaluate the definite integral.

$\int_{\ln 2}^{\ln 5} e^x\,dx =$ 3

$\int_3^{-3} \frac{12+x^2}{x^2}\,dx =$ 2

$\int_0^4 |x^2 - 4x + 3|\,dx =$ 4

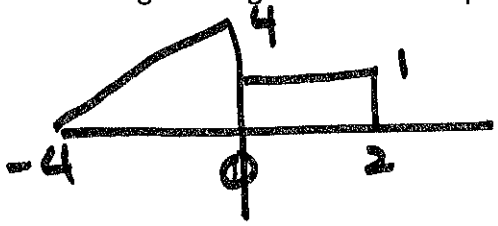
$\int_{\pi/2}^{3\pi/2} f(x)\,dx$ if $f(x) = \begin{cases} \sin x, & x < \pi \\ \cos x, & x \geq \pi \end{cases} =$ 0

$\int_4^4 x^2 + 2x + 2\,dx =$ 0

$\int_0^{\frac{\pi}{2}} \sin^2 3x \cos 3x\,dx =$ $-1/9$

$\int_2^4 x\sqrt{x-2}\,dx =$ $\frac{64\sqrt{5}}{15} \approx 6.033997$

3. Let $f(x) = \begin{cases} 1 & x \geq 0 \\ x+4 & x < 0 \end{cases}$. Sketch and give a geometric interpretation for $\int_{-4}^{2} f(x)dx$ and evaluate this integral using formulas from plane geometry **and** using Calculus.



$\int_{-4}^{0}(x+4)dx + \int_{0}^{2} 1\,dx$

$8 + 2 = 10$

4. Write the integral that represents the net signed area between the curve, $f(x) = x^3 - 6x^2 + 8x$ and the $x-$axis over the interval $[2,6]$. Evaluate your integral ~~using your calculator.~~

$\int_2^6 (x^3 - 6x^2 + 8x)\,dx = 32$

5. Find the total area between the curve, $f(x) = x^3 - 6x^2 + 8x$ and the $x-$axis over the interval $[2,6]$.

$$\int_2^6 |x^3 - 6x^2 + 8x|\,dx = 40$$

6. A particle moves along an s-axis with acceleration $a(t) = \sin(t)$ if $v(0) = -1$ and $s(0) = 1$. Find the total distance traveled by the particle over the interval $0 \le t \le \frac{3\pi}{2}$ and the position function. Find $s\left(\frac{\pi}{4}\right)$.

$v(t) = -\cos(t)$

$s(t) = -\sin(x) + 1$

$s\left(\frac{\pi}{4}\right) = -\sin\left(\frac{\pi}{4}\right) + 1$

$= -\frac{\sqrt{2}}{2} + 1$

7. $F(x) = \int_3^x \frac{t}{t-4}\,dt$

   a. Find $F(3)$. 0

   b. Find $F'(3)$. -3

   c. Find $F''(3)$. -4

   d. Over what intervals is $F(x) = \int_3^x \frac{t}{t-4}\,dt$ increasing or decreasing? INC: $(-\infty, 0) \cup (4, +\infty)$ DEC: $(0, 4)$

   e. Describe the concavity of $F(x) = \int_3^x \frac{t}{t-4}\,dt$

Concave down $(-\infty, +\infty)$

8. $\frac{dy}{dx} = x\sqrt{4 - x^2}$ Solve the differential equation with initial condition $y(2) = 3$.

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

9. $\frac{dy}{dx} = x\sqrt{x^2 + 4}$ Solve the differential equation with initial condition $y(0) = \frac{-1}{3}$.

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