MATH 2320 Practice Test 1

Name:_____

1 Anti Derivative and u sub

1. Compute the following Integrals

   (a) $\displaystyle\int \sqrt{3x} + 4\sec(x)\tan(x) - \frac{2}{\sqrt{1-x^2}}\,dx$

   (b) $\displaystyle\int \frac{3x^2 - 4\sqrt{x} + 3}{x}\,dx$

   (c) $\displaystyle\int \csc(x)[\cot(x) + \sin(x)]\,dx$

   (d) $\displaystyle\int \frac{x}{1+x^2}\,dx$

   (e) $\displaystyle\int \frac{x}{1+x^4}\,dx$

   (f) $\displaystyle\int \frac{e^x}{1+e^{2x}}\,dx$

   (g) $\displaystyle\int \sin^3(2x)\cos(2x)\,dx$

   (h) $\displaystyle\int \sin(3x)\cos^{1/2}(3x)\,dx$

   (i) $\displaystyle\int \sin(x)\sec^2(\cos(x))\,dx$

2 Definition of the integral

2. Let $f(x) = 3x + 4$ over the interval $[1, 6]$. Let $n = 5$.

   (a) Graph the function with n regions. Label the important points on the graph.

   (b) Compute the LH rule Riemann sum.

   (c) Compute the RH rule Riemann sum.

3. Using the **definition** of the integral compute

$$\int_1^4 3x - 2\,dx.$$

4. Using the **FTC II** compute

$$\int_1^4 3x - 2\,dx.$$

5. Using the **FTC I** compute

   (a) $\dfrac{d}{dx}\left[\displaystyle\int_4^{x^2} f(t)\,dt\right]$

   (b) $\dfrac{d}{dx}\left[\displaystyle\int_4^{3x+2} e^{t^3}\,dt\right]$

   (c) $\dfrac{d}{dx}\left[\displaystyle\int_x^{2x} f(t)\,dt\right]$

6. For $f(x) = x^3$ and $[0, 3]$ find f_{ave}. And find the c from the MVTI.

7. For $f(x) = 1+x^2$ and $[-2, 0]$ find f_{ave}. And find the c from the MVTI.

3 Application of the integral

8. Velocity, Acceleration and Position

   (a) Let $a(t) = -5\sin(t)$, $v(0) = 5$ and $s(0) = -7$.

      i. Find $v(t)$ and $s(t)$.

      ii. When does the object stop?

   (b) Let $a(t) = -12t$, $v(0) = 6$ and $s(0) = 0$.

      i. Find $v(t)$ and $s(t)$.

      ii. When does the object stop?

      iii. What is the position of the object when it stops?

9. Find the area between the functions $y = x^2$ and $y = 4$.

10. Find the area between the functions $y = x^2$ and $y = x + 1$.

11. Find the area between the functions $y = e^{3x}$, $y = 4$ and the y-axis.

12. Find the area between the functions $x = y^2$ and $x = 4$.

13. Find the area between the functions $x = y^2$ and $y = x - 1$.

14. Find the area between the functions $y = \ln(x)$, $x = 1$ and $y = 4$.

15. Find the area between the functions $y = \ln(x)$, $x = 3$ and the x-axis.

16. Find the volume of the solid formed when rotating the region bounded by $y = x^2$ and $y = 4$ around the x-axis using discs.

17. Find the volume of the solid formed when rotating the region bounded by $y = x^2$ and $y = 4$ in the first quadrant around the y-axis using discs.

18. Find the volume of the solid formed when rotating the region bounded by $y = e^{3x}$, $y = 4$ and the y-axis around the x-axis using discs.

19. Find the volume of the solid formed when rotating the region bounded by $y = x^2$ and $y = 4$ around the x-axis using shells.

20. Find the volume of the solid formed when rotating the region bounded by $y = x^2$ and $y = 4x$ around the y-axis using shells.

21. Rotate the region bounded by $y = 3x$, $y = 4$ and the y-axis around the y-axis using discs.

    (a) Set up the integral with discs and with shells.

    (b) Compute both of the integrals and compare.

22. Rotate the region bounded by $y = e^{3x}$, $y = 4$ and the y-axis around the y-axis using discs.

    (a) Set up the integral with discs and with shells.

    (b) Compute one of the integrals.

23. Rotate the region bounded by the ellipse $x^2 + \frac{y^2}{4} = 1$, $y = 2x - 2$ around the x-axis using discs.

    (a) Set up the integral with discs and with shells.

    (b) Compute both of the integrals and compare.

24. Compute the following integrals using u-sub.

    (a) $\int xe^{x^2}\,dx$

    (b) $\int x\sec^2(x^2)\,dx$

    (c) $\int (x^2+2)e^{x^3+6x}\,dx$

    (d) $\int x\sqrt{x-1}\,dx$

(e) $\int x\sqrt{x^2-1}\,dx$

(f) $\int \frac{3x}{1+x^2}\,dx$

(g) $\int \frac{4}{1+x^2}\,dx$

(h) $\int \sec^2(x)\sin(\tan(x))\,dx$

(i) $\int e^{2x}\sec(e^{2x})\tan(e^{2x})\,dx$

(j) $\int \tan(x)\,dx$. Hint use $\tan(x) = \frac{\sin(x)}{\cos(x)}$ and u-sub.

(k) $\int \cot(x)\,dx$

(l) $\int \frac{\sec(x)\tan(x)+\sec^2(x)}{\sec(x)+\tan(x)}\,dx$. I used $u = \sec(x) + \tan(x)$. After you perform the integration simplify

(m) $\int \frac{x}{\sqrt{x+4}}\,dx$

(n) $\int \frac{x}{\sqrt{x^2+4}}\,dx$

(o) ~~$\int x^2\sqrt{x+4}\,dx$~~

(p) ~~$\int x\sqrt{x^2+4}\,dx$~~

(q) ~~$\int \frac{e^{2x}}{1+e^{2x}}\,dx$~~