MATH 150 Final Review 5 Fall

1. Which of the following is true for $f(x) = x^4 - 2x^3$
   (a) no local extrema
   (b) two points of inflection and one local extrema
   (c) two points of inflection and two local extrema
   (d) two points of inflection and three local extrema
   (e) one point of inflection and two local extrema

2. If $F(x) = \int_0^x \sqrt{\tan(t)}\ dt$, then $F'(.5) = ?$

3. Use implicit differentiation to find the slope of the tangent line of $xy^3 + x^2y^2 = 6$ at $(2, 1)$.

4. If a particles position is given by $s(t) = t^3 + t^2 - t$, find the position when the velocity is zero for $t \geq 0$.

5. Find the value of x that maximizes the area of the inscribed rectangle under $y = e^{-x^2}$

6. Find $\lim_{h\to 0} \dfrac{(2+h)^2 - 4}{h}$.

7. Find the Riemann Sum for $f(x) = x^2 - 4$ on $0 \leq x \leq 4$ with 4 subintervals taking the sample points to be left-hand endpoints.

8. $\int (x-1)\sqrt{x}\ dx$

9. Find $\lim_{x\to\infty} \dfrac{x^2 - 4}{2 + x - 4x^2}$

10. Use Simpson's Rule with $n = 6$ to approximate $\int_0^2 e^{x^2}\, dx$.

11. Find the number c that satisfies the Mean Value Theorem for Integrals for $f(x) = 1+x^2$ on $[-1, 2]$.

12. Find the critical numbers of $f(x) = e^{x^3 - x}$

13. Find y' if $y = \cos^2\left(\sqrt{3x^2 - x}\right)$

14. $\int 3^x \tan(3^x)\, dx$

15. Given $F(x) = f(g(x)),\ g(3) = 6,\ g'(3) = 4,\ f'(3) = 2$, and $f'(6) = 7$, find $F'(3)$.

16. A bacteria doubles every 20 minutes. Determine the number of cells after 120 minutes if initially there were 100,000 cells.

17. If Radon-222 has a half-life of 12 days, how long will it take to reduce to 40% of its original amount?

Answers

1) B

2) $\sqrt{\tan(0.5)}$

3) $-\dfrac{5}{14}$

4) $-\dfrac{5}{27}$

5) $\dfrac{1}{\sqrt{2}}$

6) 4

7) -2

8) $\dfrac{2}{5}x^{5/2} - \dfrac{2}{3}x^{3/2} + C$

9) $-\dfrac{1}{4}$

10) 16.691883387416

11) $c = \pm 1$

12) $\pm\sqrt{\dfrac{1}{3}}$

13) $-\cos(\sqrt{3x^2 - x})\sin(\sqrt{3x^2 - x})\left(\dfrac{6x - 1}{\sqrt{3x^2 - x}}\right)$

14) $\dfrac{1}{\ln(3)}\ln|\sec(3^x)| + C$

15) 28

16) 6400000

17) 15.86 days