Math 100 Answers for Review Questions for the Final Exam

1a) 2

1b) 28

2a) $-\infty$

2b) 0

2c) -3

3a) -1

3b) 1

3c) D.N.E.

3d) 1

4a) ∞

4b) 3

4c) nonremovable discontinuity

5. 6

6. $-\infty$

7a) 2

7b) $y = 2$ is a horizontal asymptote for the function.

8a) $f'(x) = \lim_{\Delta x \to 0} \dfrac{f(x+\Delta x) - f(x)}{\Delta x}$

8b) $-\dfrac{16}{9t^3}$

9a) 0.7

b) $\dfrac{7}{x} + \dfrac{2}{4x+1} - \ln 7 - \dfrac{9x^2}{x^3+5}$

c) $3^x \ln 3 + 3x^2 + x^x(\ln x + 1)$

d) $(3x)^{\cos x}\left(-\sin x \cdot \ln 3x + \dfrac{\cos x}{x}\right)$

e) <u>differential</u> not a derivative

$\csc 5t(1 - 5t\cot 5t)\,dt$

f) $\cos(q\tan q)^2 \cdot 2(q\tan q)\cdot(\tan q + q\sec^2 q)$

g) $\sqrt{9+x^6}$

10. 21

11. $y = -3$

12. relative minimum at $(3, f(3))$.

13. $(-1,-3)$ and $(1,-3)$

$f(x) = 1 - 5x^{-1} + 4x^{-2}$

14a) $f'(x) = 5x^{-2} - 8x^{-3} = \dfrac{5x-8}{x^3}$

$f''(x) = -10x^{-3} + 24x^{-4} = \dfrac{24-10x}{x^4}$

b) $\{x \mid x \neq 0\}$

c) intercepts: $(4,0)$ and $(1,0)$

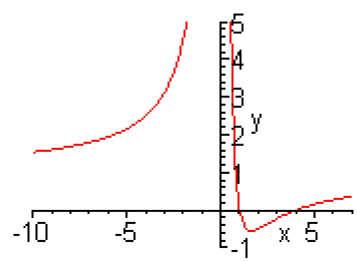
d) vertical asymptote: $x = 0$

horizontal asymptote: $y = 1$

e) relative minimum: $\left(\dfrac{8}{5}, -\dfrac{9}{16}\right)$

f) point of inflection: $\left(\dfrac{12}{5}, -\dfrac{7}{18}\right)$

14g)



15. $x = \pm\dfrac{1}{\sqrt{2a}} = \pm\dfrac{\sqrt{2a}}{2a}$

16a) $\dfrac{100}{9}cm \times \dfrac{50}{9}cm \times \dfrac{25}{3}cm$

b) $\dfrac{75}{7}cm \times \dfrac{75}{14}cm \times \dfrac{125}{14}cm$

17a) away from the radar

b) decreasing at a rate of 75 rad/hr

c) $150\sqrt{3}$ km/hr or 260 km/hr

18. 75/4 m/s or 18.75 m/s

19a) 1 m/s

b) $1+\frac{\sqrt{3}}{4}\approx 1.43$ m/s

20. $s(t)=\frac{4}{15}(t+4)^{\frac{5}{2}}-\frac{16}{3}t-\frac{128}{15}$

21. $a(e-1)=-\frac{1}{e^2}$

22a) $x-\frac{8}{3}x^{\frac{3}{2}}+2x^2+C$

b) $-\frac{1}{3}(1+\cos 2x)^{\frac{3}{2}}+C$

c) $\frac{x^2}{2}-\frac{e^{3x}}{3}+C$

d) $1-\cos 1\approx 0.4597$

e) $\tan x+\sec x+C$

f) $-\ln(1-\sin x)+C$

g) $\frac{1}{4}\ln\left(x^4+1\right)+C$

h) $\frac{1}{4}x^4-\frac{1}{3}x^3+\frac{1}{2}x^2-x+2\ln(x+1)+C$

i) $\frac{1}{5}\ln\left|\sec 5x+\tan 5x\right|+C$

23) $\frac{32}{15}$

24a) $\int_a^b f(x)dx=\lim_{n\to\infty}\sum_{i=1}^{n} f(a+i\Delta x)\Delta x$

where $\Delta x=\frac{b-a}{n}$.

24b) 10

25. $c_i=-6+\frac{26i}{n}$

26. $f(x)=\frac{1}{12}x^4-\cos x+7x+3$

27. $y=C\sqrt{x^2+4}$

28. Solve $\frac{dV}{dt}=t^2$ where $V(0)=10$.

Finally $V(6)=82$ ml.

29a) $A(t)=A_0e^{kt}$ or $A(t)=A_0e^{-kt}$

b) 14% of the initial value

30. $f(20)$ is the population of the town in thousands in 1990.

$f^{-1}(20)$ is the year (where t = 0 corresponds to 1970) when the population of the town is 20, 000.

31. $2\frac{20}{27}\approx 2.74$

32. Find the x-intercept of $h(x)=\sin x-\frac{x}{2}$;

1.4, **2.2649**, 1.94567, 1.8968, 1.8955

33. Newton's method is a numerical approximation technique that is used to find the x – intercept of a function. Start with an initial guess, x_1. Find the tangent line to the graph at the point $(x_1, f(x_1))$. The x-intercept of this tangent line is the second estimate x_2. (Draw a picture to illustrate this.) Repeat the above procedure to find estimates x_3, x_4, and so on. If Newton's method "works", then the sequence $x_1, x_2, \ldots$ converges to the x-intercept of the function.

34. Trapezoidal Rule: 0.316
Simpson's Rule: 0.310