Sample questions for exam 2 math 1452

1. Find he following indefnite integral $\int (x^2+x)e^{2x}\,dx$

   (a) $\frac{3}{2}x^2e^{2x} - xe^{2x} + \frac{1}{2}e^{2x} + C$
   (b) $\frac{1}{2}x^2e^{2x} + C$
   (c) $\frac{3}{2}x^2e^{2x} + xe^{2x} + \frac{1}{2}e^{2x} + C$
   (d) $\left(\frac{1}{3}x^3 + \frac{1}{2}x^2\right)\left(\frac{1}{2}e^{2x}\right) + C$
   (e) none of the above

2. $\int \frac{1}{(x+2)(x-1)}dx =$

   (a) $-\frac{1}{3}\ln|x+2| + \frac{1}{3}\ln|x-1| + C$
   (b) $\frac{1}{3}\ln|x-1| - \frac{1}{3}\ln|x-1| + C$
   (c) $\frac{2}{3}\ln|x-1| - \frac{1}{3}\ln|x-1| + C$
   (d) $\ln|x-1|\ln|x-1| + C$
   (e) None

3. What is the right partial fractions form for the function $\frac{x}{(x^2+2x+5)^2(x-1)^2}$?

   (a) $\frac{A}{(x^2+2x+5)^2} + \frac{B}{(x-1)^2}$
   (b) $\frac{Ax+B}{(x^2+2x+5)^2} + \frac{C}{(x-1)^2}$
   (c) $\frac{Ax+B}{x^2+2x+5} + \frac{Cx+D}{(x^2+2x+5)^2} + \frac{E}{(x-1)^2}$
   (d) $\frac{A}{x^2+2x+5} + \frac{B}{(x^2+2x+5)^2} + \frac{C}{x-1} + \frac{D}{(x-1)^2}$
   (e) none of the above

4. If $\frac{10}{(x^2+2x+2)(x-2)^2} = \frac{A}{x-2} + \frac{B}{(x-2)^2} + \frac{Cx+D}{x^2+2x+2}$ determine the correct value of B.

   (a) 1
   (b) 3
   (c) -3
   (d) 3/5
   (e) none of the above

5. If $I = \int e^x \cos(2x)\,dx$ then which of the following is true and shows up near the end of the calculaion when one is determining the integral?

   (a) $I = e^x\cos 2x + 2e^x \sin 2x$
   (b) $I = 2e^x\cos 2x + e^x\sin 2x - 4I$

(c) $I = 2e^x \cos 2x + e^x \sin 2x - 3I$

(d) $I = e^x \cos 2x + 2e^x \sin 2x - 4I$

(e) None

6. Which of the following is true assuming all integral and derivatives exist?

(a) $\int_a^b f(x)g(x)dx = \int_a^b f(x)dx \int_a^b g(x)dx$

(b) $\int_a^b f(x)g(x)dx = \int_a^c f(x)dx \int_c^b g(x)dx$

(c) $\int_a^b f(x)g'(x)dx = [f(b)g(b) - f(a)g(a)] - \int_a^b f'(x)g(x)dx$

(d) $\int_a^b f(x)g'(x)dx = [f(b)g(b) + f(a)g(a)] - \int_a^b f(x)g'(x)dx$

(e) $\int_a^b f(x)g(x)dx = \left(\int_a^b f(x)dx\right) g(x) + f(x) \left(\int_a^b g(x)dx\right)$

7. Which comparison is valid and shows that $\int_1^\infty \frac{2}{x^2+\sqrt{x}}dx$ converges?

(a) $\int_1^\infty \frac{1}{x^2}dx \leq \int_1^\infty \frac{2}{x^2+\sqrt{x}}dx \int_1^\infty \frac{1}{x^2}dx \leq \int_1^\infty \frac{2}{x^2+\sqrt{x}}dx$

(b) $\int_1^\infty \frac{2}{x^2+\sqrt{x}}dx \leq 2\int_1^\infty \frac{1}{x^2}dx$

(c) $\int_1^\infty \frac{2}{x^2+\sqrt{x}}dx \leq 2\int_1^\infty \frac{1}{\sqrt{x}}dx$

(d) $\int_1^\infty \frac{1}{2\sqrt{x}}dx \leq \int_1^\infty \frac{2}{x^2+\sqrt{x}}dx$

(e) None

8. Which comparison is valid and shows that $\int_0^1 \frac{1}{x^2+\sqrt{x}}dx$ converges?

(a) $\int_0^1 \frac{1}{x^2}dx \leq \int_0^1 \frac{2}{x^2+\sqrt{x}}dx$

(b) $\int_0^1 \frac{1}{2\sqrt{x}}dx \leq \int_0^1 \frac{1}{x^2+\sqrt{x}}dx$

(c) $\int_0^1 \frac{1}{x^2+\sqrt{x}}dx \leq \int_0^1 \frac{1}{2\sqrt{x}}dx$

(d) $\int_0^1 \frac{1}{x^2+\sqrt{x}}dx \leq \int_0^1 \frac{1}{\sqrt{x}}dx$

(e) none

9. Which comparison is valid and shows that $\int_0^1 \frac{1}{1+\sqrt{x}}dx$ diverges

(a) $\int_0^1 \frac{1}{1+\sqrt{x}}dx \leq \int_0^1 \frac{1}{\sqrt{x}}dx$

(b) $\int_0^1 \frac{1}{\sqrt{x}}dx \leq \int_0^1 \frac{1}{1+\sqrt{x}}dx$

(c) $\frac{1}{2}\int_0^1 \frac{1}{\sqrt{x}}dx \leq \int_0^1 \frac{1}{1+\sqrt{x}}dx$

(d) $\int_0^1 \frac{1}{1+\sqrt{x}}dx \leq \int_0^1 \frac{1}{x}dx$

(e) none

10. Evaluate the integral $\int_0^1 x^2 e^{2x} dx$

    (a) $\frac{1}{4}e^2 - \frac{1}{4}$
    (b) $\frac{1}{4}e^2 + \frac{1}{4}$
    (c) $\frac{1}{2}e^2 + \frac{1}{4}$
    (d) $\frac{1}{2}e^2 - \frac{1}{4}$
    (e) none

11. Evaluate $\int_1^\infty xe^{-x} dx$

    (a) $2e^{-1}$
    (b) 2
    (c) It diverges
    (d) e^{-1}
    (e) None of the above is correct

12. Which of the following integrals is *not* improper?

    (a) $\int_1^\infty \frac{1}{(x-1)(x-3)^2} dx$
    (b) $\int_1^2 \frac{1}{(x-1)(x-3)^2} dx$
    (c) $\int_2^3 \frac{1}{(x-1)(x-3)^2} dx$
    (d) $\int_4^5 \frac{1}{(x-1)(x-3)^2} dx$
    (e) *None*

13. Find the antiderivative $\int \frac{\sqrt{4-x^2}}{x} dx$

    (a) $\sqrt{4-x^2} - \tan^{-1} \frac{2}{\sqrt{4-x^2}} + C$
    (b) $\sqrt{4-x^2} + C$
    (c) $\sqrt{4-x^2} - \tan^{-1} \frac{1}{\sqrt{4-x^2}} + C$
    (d) $\frac{1}{2}\sqrt{4-x^2} - \tan^{-1} \frac{1}{\sqrt{4-x^2}} + C$
    (e) None

14. What is the correct/best trigonometric substitution for $\int \frac{x^2}{(9-x^2)^{3/2}} dx$?

    (a) $x = 3\sin\theta$
    (b) $x = \frac{1}{3}\sin\theta$
    (c) $x = \frac{1}{9}\sin\theta$
    (d) $x = \frac{1}{3}\sin\theta$
    (e) none

15. What is the correct/best trigonometric substitution for $\int \frac{1}{(4x^2-9)^{3/2}}dx$?

    (a) $x = 3\sin\theta$
    (b) $x = 2\sec\theta$
    (c) $x = (3/2)\sin\theta$
    (d) $x = (3/2)\sec\theta$
    (e) none of the above

16. What is the correct/best trigonometric substitution for $\int \frac{1}{(x^2-4x)^{3/2}}dx$ for $x > 4$?

    (a) $x = 2\cos\theta$
    (b) $x - 1 = 2\cos\theta$
    (c) $x = 2\tan\theta$
    (d) $x - 1 = 2\tan\theta$
    (e) $x = 2\sin\theta$

17. For what values of p does the following improper integral converge? $\int_1^2 \frac{1}{(x-1)^p}$

    (a) $p > 2$
    (b) $p \geq 1$
    (c) $p \leq 1$
    (d) $p < 1$
    (e) none are correct

18. Which of the following give the correct interpretation of the improper integral as a limit?

    (a) $\int_0^3 \frac{1}{(x-1)^{1/2}}dx = \lim_{a\to 0^+} \int_a^3 \frac{1}{(x-1)^{1/2}}dx$
    (b) $\int_0^3 \frac{1}{(x-1)^{1/2}}dx = \lim_{a\to 1^-} \int_a^3 \frac{1}{(x-1)^{1/2}}dx$
    (c) $\int_0^3 \frac{1}{(x-1)^{1/2}}dx = \lim_{a\to 1^-} \int_0^a \frac{1}{(x-1)^{1/2}}dx + \lim_{a\to 1^+} \int_a^3 \frac{1}{(x-1)^{1/2}}dx$
    (d) $\int_0^3 \frac{1}{(x-1)^{1/2}}dx == \lim_{a\to 0^-} \int_0^a \frac{1}{(x-1)^{1/2}}dx + \lim_{a\to 0^+} \int_a^3 \frac{1}{(x-1)^{1/2}}dx$
    (e) None are correct

19. After making the correct trig substitution, the integral $\int \frac{1}{x^4\sqrt{9-x^2}}$ becomes and integral in a new vaiable θ. The integral is which of the following?

    (a) $\frac{1}{81}\int \csc^4(\theta)d\theta$
    (b) $\frac{1}{81}\int \sin^4(\theta)d\theta$
    (c) $\frac{1}{9}\int \csc^4(\theta)d\theta$

(d) $\frac{1}{9}\int \sec^3(\theta)d\theta$

(e) none of the above

20. What u-substitution is appropriate for the integral $\int \sec^3(x)\tan^3(x)\,dx$?

(a) $u = \tan(x)$

(b) $u = \tan(x)$

(c) $u = \sec^2(x)$

(d) $u = \sec(x)$

(e) none of the above

21. Find the integral $\int_0^{\pi} \sin^3(x)dx$

(a) 4

(b) $\frac{4}{3}$

(c) 3

(d) $\frac{3}{4}$

(e) None of the above.