3. Let $f(x)=\begin{cases}\dfrac{|x-3|}{x-3}, & x\neq 3\\ 0, & x=3\end{cases}$. Find $\lim\limits_{x\to 3^+} f(x)$.

a) 1

b) -1

c) ∞

d) 3

e) none of the above

4. Find $\dfrac{dy}{dx}$ for $y=x^3\sqrt{x+1}$.

a) $\dfrac{3x^2}{2\sqrt{x+1}}$

b) $\dfrac{x^2(7x+6)}{2\sqrt{x+1}}$

c) $3x^2\sqrt{x+1}$

d) $\dfrac{7x^3+x^2}{2\sqrt{x+1}}$

e) none of the above

5. Let $f(x)$ be a continuous even function over the interval $(-\infty,\infty)$. Given $\int_{-4}^{4} f(x)\,dx=18$, $\int_{-2}^{3} f(x)\,dx=12$, and $\int_{2}^{3} f(x)\,dx=2$. What is $\int_{3}^{4} f(x)\,dx$?

a) 1

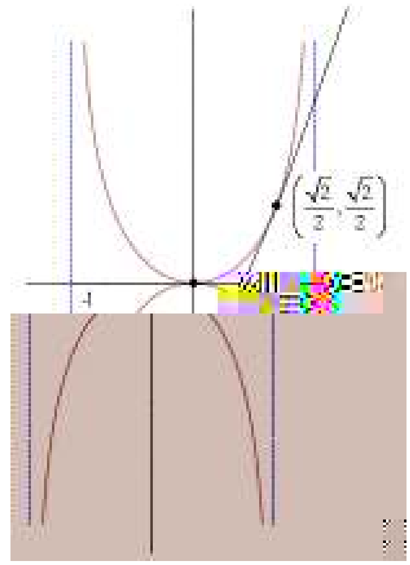
b) 2

c) 3

d) 4

e) none of the above

6. Find the value of t such that $f(t)=\begin{cases} -t^2-t+2 & \text{for } t<1 \\ t-1 & \text{for } t\geq 1 \end{cases}$ is the largest on the closed interval [ ]



9. Find $\lim\limits_{x \to e} \left(\dfrac{\ln(\ln x)}{\ln x} \right)$.

a) $\ln$
b) 0
c) 1
d) e
e) none of the above

10. Find the point of inflection for the cubic polynomial $p(x) = ax^3 + bx^2 + cx + d$.

a) $x_0 = -\dfrac{b}{3a},\ \ y_0 = \dfrac{2b^3}{27a^2} - \dfrac{bc}{3a} + d$

b) $x_0 = -\dfrac{b}{2a},\ \ y_0 = \dfrac{b^3}{9a^2} - \dfrac{2bc}{3a} + d$

c) $x_0 = -\dfrac{b}{2a},\ \ y_0 = \dfrac{b^2}{8a^2} - \dfrac{bc}{2a} + d$

d) $x_0 = -\dfrac{b}{3a},\ \ y_0 = \dfrac{b^3 c}{27a^3} + \dfrac{bc}{3a} + d$

e) none of the above

11. Determine the indefinite integral $\int \cos^{-1}(2x)\, dx$.

a) $x\cos^{-1}(2x) - \dfrac{1}{2}\sqrt{1-4x^2} + C$

b) $2x\cos^{-1}(2x) - \sqrt{1-4x^2} + C$

c) $-\sqrt{\quad}$

.

12. What is the smallest slope that the tangent line to the curve $y = x^5 + 2x$ can have?

a) 0

b) $\frac{1}{2}$

c) 1

d) 2

e) none of the above

13. Two boats leave the same port at the same time with one boat traveling north at 15 miles per hour and the other boat traveling west at 20 miles per hour. How fast is the distance between the boats changing after 2 hours?

a) 25 miles/hr

b) 35 miles/hr

c) 5 miles/hr

d) 10 miles/hr

e) none of the above

14. Find the area of the region bounded by the curves $f(x) = x + 1$ and $g(x) = x^2 - 2x + 1$.

a) $\frac{3}{4}$

b) 9

c) $\frac{9}{2}$

d) $\frac{5}{2}$

e) none of the above

15. Find $\lim_{x\to\infty}\left(\frac{2x-1}{2x}\right)^{x}$.

18. Suppose that f is continuous on $[a,b]$, twice differentiable in (a,b), and $f'(x)$ is never zero at any point of (a,b). Which of the following is then true?

a) f has no maximum value on $[a,b]$

b) f must have the maximum value at an interior point of the interval (a,b)

c) f has the maximum value at an endpoint , either a or b

d) f must have the maximum value at $x = a$

e) none of the above

19. Find an equation in polar coordinates for the curve $x = e^{2t}\cos t$, $y = e^{2t}\sin t$, $-\infty < t < \infty$.

a) $r = e^{\theta}$

b) $r = e^{2\sin\theta}$

c) $r = e^{2\theta}$

d) $r = e^{2\cos\theta}$

e) none of the above

20. Let $f(x) = \sin 2x$. Find all the values of x in the interval $(0, 2\pi)$ such that $f(x) + f''(x) = 0$.

a) $x = \frac{\pi}{2}, \pi, \frac{3\pi}{2}$

b) $x = \frac{\pi}{4}, \frac{5\pi}{4}$

c) $x = \frac{3\pi}{4}, \frac{7\pi}{4}$

d) $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

e) none of the above

21. Find $\int \frac{1}{\sin^2 x + 4\cos^2 x}\,dx$.

a) $\frac{1}{2}\tan^{1} \frac{\sin^2 x}{2}$

24. Let f be continuous on $[a, b]$ and twice differentiable on (a, b). If there exists a number c such that $a < c < b$, and $f'(c) = 0$, which of the following must be true?

a) $f(a) < f(b)$

b) $f(a) = f(b)$

c) $f(a) > f(b)$

d) $f(c) = \dfrac{f(b) - f(a)}{2}$

e) none of the above

25. Find the limit: $\lim_{x \to 5} \dfrac{\left(\sqrt{2x-1} - 3\right)}{x-5}$.

a) $\dfrac{1}{2}$

b) $\dfrac{1}{3}$

c) $\dfrac{1}{5}$

d) does not exist

e) none of the above

27. Find $\int \frac{e^x}{1+e^{2x}}\,dx$.

a) $\arctan\left(e^{2x}\right)+C$

b) $\arctan\left(e^{x}\right)+C$

c) $\frac{1}{2}\ln\left|1+e^{2x}\right|+C$

d) $\frac{1}{2}\ln\left|1+e^{x}\right|+C$

e) none of the above

28. A right triangle in the first quadrant has the coordinate axes as sides, and the hypotenuse passes through the point $(1, 8)$. Find the vertices of the triangle such that the length of the hypotenuse is minimized.

a) $(0, 5), (10, 0), (0, 0)$

b) $(\quad)\ (\quad)\ (\quad)$

30. Find $\frac{dF}{dx}$ when $F(x) = \int_0^{\sin x} \sqrt{t}\, dt$.

a) $(-\sin x)\sqrt{\cos x}$

b) $(\sin x)\sqrt{\cos x}$

c) $(-\cos x)\sqrt{\sin x}$

d) $(\cos x)\sqrt{\sin x}$

e) none of the above

31. Gabriel’s Horn is the name given to the solid formed by revolving the unbounded region under the curve $y = \frac{1}{x}$ for $x \geq 1$ about the x-axis. Find the volume of Gabriel’s Horn.

a) π

b) 2π

c) 3π

d) ∞

e) none of the above

32. Use differentialvSD'K9H'vTme6 5T j eIm:'$""v9v9vDx$xS6vSD'DSK$ID$$9SxvT f D5DK$ID$$6v9v

34. Find $\int \frac{\sec^3\theta\tan\theta}{1+\tan^2\theta}\,d\theta$.

a) $\frac{1}{4}\sec^4\theta + C$

b) $\frac{1}{2}\sec^2\theta + C$

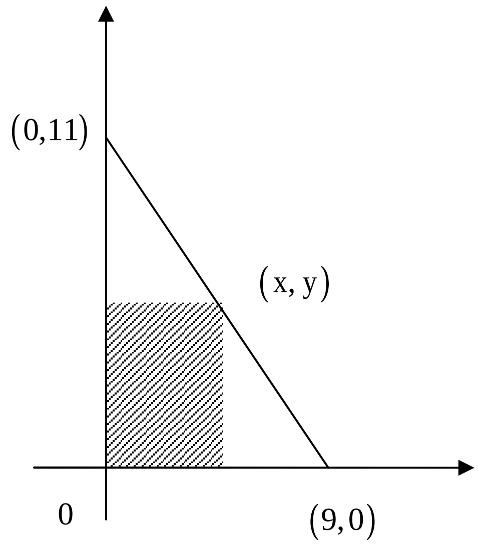
c) $\frac{1}{4}\sec^2\theta\tan^2\theta + C$

d) $\sec\theta \quad C$

37. Ellipse E is centered at the origin and has a horizontal minor axis of length 4. If you rotate the portion of E which falls only in the first and second quadrants about the x-axis, the resulting rotational solid has volume $\frac{800\pi}{27}$. Find the length of E's major axis.

a) —

40. A rectangle has one vertex at $(0, 0)$ and the opposite vertex lies in the first quadrant on the line passing through $(0, 11)$ and $(9, 0)$. Find the area of the largest such rectangle.



a) $\frac{33}{2}$

b) $\frac{99}{4}$

c) $\frac{99}{2}$

d) $\frac{33}{4}$

e) none of the above