$\frac{0}{0}, \frac{\infty}{\infty}, 0\cdot\infty \rightarrow \frac{0}{0} \text{ or } \frac{\infty}{\infty}$ $\left(\frac{1}{\infty}\to 0\right)$

$1^{\infty}, \infty^{0}, 0^{0} \rightarrow e^{\ln \bigcirc}$

$\infty - \infty$ combine.

PRINTABLE VERSION

Quiz 11

You scored 0 out of 100

Question 1

You did not answer the question.

Calculate the limit.

$$\lim_{x\to\infty} 6x^4 \sin\left(\frac{1}{x}\right) \underset{(\infty\cdot 0)}{\overset{(L')}{=}} \lim_{x\to\infty} \frac{\sin(\frac{1}{x})}{\frac{1}{6x^4}}$$

$$\underset{(\frac{0}{0})}{\overset{(L')}{=}} \lim_{x\to\infty} \frac{\frac{-1}{x^2}\cdot\cos(\frac{1}{x})}{\frac{-4}{6x^5}} = \lim_{x\to\infty} \frac{3}{2}\frac{x^5}{x^2}\cos\left(\frac{1}{x}\right)$$

$$= \infty \cdot 1 = \infty$$

a) 4

b) 6

c) ∞

d) 0

e) 1

Question 2

You did not answer the question.

Calculate the limit.

$$\lim_{x\to\infty} \frac{\ln(x^5)}{x} \underset{(\frac{\infty}{\infty})}{\overset{(L')}{=}} \lim_{x\to\infty} \frac{5\cdot\frac{1}{x}}{1} = \lim_{x\to\infty} \frac{5}{x} = 0$$

$5\ln x$

a) 1

b) 0

c) -1

d) -5

e) 5

Question 3

You did not answer the question.

Calculate the limit.

$$\lim_{x\to\infty} \frac{(3\sqrt{1+x^2})}{(2x^2)} \to 0$$

$$\deg(3\sqrt{1+x^2}) = 1 < 2 = \deg(2x^2)$$

a) $\frac{2}{3}$

b) 0

c) 1

d) $-\frac{3}{2}$

e) $\frac{3}{2}$

Question 4

You did not answer the question.

Calculate the limit.

$$\lim_{x\to 1} x^{\left(\frac{5}{x-1}\right)} \overset{(L')}{=} 1^{\infty}$$

Take ln. $\lim_{x\to 1} \ln x^{(\frac{5}{x-1})} = \lim_{x\to 1} (\frac{5}{x-1})\ln x$

$$\underset{(\frac{0}{0})}{\overset{(L')}{=}} \lim_{x\to 1} \frac{\frac{5}{x}}{1} = 5.$$

Take $e \Rightarrow e^5$

a) 1

b) e^5

c) 0

d) $\frac{1}{e^5}$

e) $-e^5$

Question 5

You did not answer the question.

Calculate the limit.

$(\infty-\infty)$

$\lim_{x\to 0}\left(\frac{9}{x}-9\cot(x)\right) \underset{\infty-\infty}{=} \lim_{x\to 0} \frac{9}{x}-\frac{9\cos(x)}{\sin(x)}$

$= \lim_{x\to 0}\frac{9\sin(x)-9x\cos(x)}{x\sin(x)} \underset{(\frac{0}{0})}{\overset{L'}{=}} \lim_{x\to 0}\frac{9\cos(x)-9\cos(x)+9x\sin(x)}{\sin(x)+x\cos(x)}$

$\underset{(\frac{0}{0})}{\overset{(L')}{=}} \lim_{x\to 0}\frac{9\sin(x)+9x\cos(x)}{\cos(x)+\cos(x)-x\sin(x)} = \frac{0}{2} = 0$

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

b) -9

c) 0

d) 9

e) $\frac{9}{4}$

a) 0

b) -4

c) -1

d) 4

e) 1

Question 6

You did not answer the question.

Calculate the limit. $(0\cdot\infty)$

$\lim_{x\to\infty}\left[\left(\frac{9}{x}\right)\left(\int_0^x \sin\left(\frac{1}{t+1}\right)dt\right)\right] \underset{(0\cdot\infty)}{\overset{(L')}{=}} \lim_{x\to\infty}\frac{\int_0^x \sin(\frac{1}{t+1})dt}{\frac{x}{9}}$

Fundamental thm. of calculus

$\underset{(\frac{\infty}{\infty})}{\overset{L'}{=}} \lim_{x\to\infty}\frac{\sin(\frac{1}{x+1})}{\frac{1}{9}} = \lim_{x\to\infty} 9\cdot\sin(\frac{1}{x+1}) = 9\cdot 0 = 0$

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

b) -9

c) 0

d) 9

e) $\frac{9}{4}$

Question 7

You did not answer the question.

Calculate the limit.

$(\infty-\infty)$

$\lim_{x\to 0}\left(\frac{4}{\sin(x)}-\frac{4}{x}\right) \underset{(\infty-\infty)}{\overset{(L')}{=}} \lim_{x\to 0}\frac{4x-4\sin(x)}{x\sin(x)}$

$\underset{(\frac{0}{0})}{\overset{(L')}{=}} \lim_{x\to 0}\frac{4-4\cos(x)}{\sin(x)+x\cos(x)} \underset{(\frac{0}{0})}{\overset{(L')}{=}} \lim_{x\to 0}\frac{4\sin(x)}{\cos(x)+\cos(x)-x\sin(x)} = \frac{0}{2} = 0$

Question 8

You did not answer the question.

Calculate the limit.

$(\infty-\infty)$

$\lim_{x\to 1}\left(\frac{7}{\ln(x)}-\frac{7x}{x-1}\right) \underset{(\infty-\infty)}{\overset{(L')}{=}} \lim_{x\to 1}\frac{7(x-1)-7x(\ln x)}{(x-1)\ln x}$

$= \lim_{x\to 1}\frac{7x-7-7x(\ln x)}{(x-1)\ln x} \underset{(\frac{0}{0})}{\overset{(L')}{=}} \lim_{x\to 1}\frac{7-7\ln(x)-7}{\ln x+\frac{x-1}{x}}$

$\underset{(\frac{0}{0})}{\overset{(L')}{=}} \lim_{x\to 1}\frac{-\frac{7}{x}}{\frac{1}{x}+\frac{1}{x^2}} = -\frac{7}{2}$

a) $\frac{7}{2}$

b) 14

c) $-\frac{7}{2}$

d) 7

e) -7

Question 9

You did not answer the question.

Calculate the limit of the sequence.

k is fixed.

$\lim_{n\to\infty}\frac{n^k}{13^n} \underset{(\frac{\infty}{\infty})}{\overset{(L')}{=}} \lim_{n\to\infty}\frac{kn^{k-1}}{\ln 13\cdot 13^n}$

$\underset{(\frac{\infty}{\infty})}{\overset{(L')}{=}} \lim_{n\to\infty}\frac{k(k-1)n^{k-2}}{(\ln 13)^2\cdot 13^n} \underset{(\frac{\infty}{\infty})}{\overset{(L')}{=}} \lim_{n\to\infty}\frac{k(k-1)(k-2)n^{k-3}}{(\ln 13)^3\cdot 13^n}$

$\underset{(\frac{\infty}{\infty})}{\overset{(L')}{=}} \cdots \underset{(\frac{\infty}{\infty})}{\overset{(L')}{=}} \lim_{n\to\infty}\frac{k(k-1)(k-2)\cdots(2)(1)}{(\ln 13)^k\, 13^n} = 0$

$\to$ a fixed number $(k)!$

$\to \infty$ as $n\to\infty$

a) 0

b) $-\frac{1}{13}$

Q10. $\lim_{n\to\infty} (\ln(n))^{\left(\frac{13}{n}\right)} \overset{(\infty^0)}{=} \lim_{n\to\infty} \left[e^{\ln(\ln(n))^{\left(\frac{13}{n}\right)}}\right]$

c) $\frac{1}{13}$

d) 1

e) ∞

$= \lim_{n\to\infty} \left[e^{\left(\frac{13}{n}\right)\cdot \ln(\ln(n))}\right]$

e^x is conti. $\Downarrow$ $= e^{\lim_{n\to\infty}\left[\left(\frac{13}{n}\right)\ln(\ln(n))\right]} = e^0 = 1$

Question 10

You did not answer the question.

Calculate the limit of the sequence.

$\lim_{n\to\infty} (\ln(n))^{\left(\frac{13}{n}\right)}$

(∞^0)

$\lim_{n\to\infty} \left[\frac{13}{n} \ln(\ln(n))\right] \overset{(L')}{\underset{\left(\frac{\infty}{\infty}\right)}{=}} \lim_{n\to\infty} \frac{13\cdot\frac{1}{\ln(n)}\cdot\frac{1}{n}}{1} = 0$

a) 1

b) -13

c) 0

d) 13

e) ∞

Question 11

You did not answer the question.

Evaluate the improper integral.

$\int_0^\infty \frac{10}{4+x^2}\,dx = \lim_{b\to\infty}\left[\int_0^b \frac{10}{4+x^2}\,dx\right]$

a) 5π

b) $\frac{5}{2}\pi$

c) $\frac{15}{4}\pi$

d) $\frac{5}{4}\pi$

$= \lim_{b\to\infty}\left[\frac{10}{2}\arctan\left(\frac{x}{2}\right)\right]_0^b$

$= \lim_{b\to\infty}\left[5\arctan\left(\frac{b}{2}\right) - 0\right]$

$= 5\cdot\frac{\pi}{2}$ $\left(\arctan\left(\frac{b}{2}\right)\to\frac{\pi}{2} \text{ as } b\to\infty\right)$

e) $\frac{5}{3}\pi$

Question 12

You did not answer the question.

Evaluate the improper integral.

$\int_0^{64} \frac{4}{x^{2/3}}\,dx = \lim_{a\to 0}\left[\int_a^{64} \frac{4}{x^{\frac{2}{3}}}\,dx\right]$

a) 24

b) 48

c) 72

d) 96

e) 32

$= \lim_{a\to 0}\left[4\cdot 3\cdot x^{\frac{1}{3}}\right]_a^{64}$

$= \lim_{a\to 0}\left[12\cdot(64)^{\frac{1}{3}} - 12\cdot a^{\frac{1}{3}}\right]$

$= 12\cdot 4 - 0 = 48$

Question 13

You did not answer the question.

Evaluate the improper integral.

$\int_0^1 \frac{10}{\sqrt{1-x^2}}\,dx = \lim_{b\to 1}\left[\int_0^b \frac{10}{\sqrt{1-x^2}}\,dx\right]$

a) 10π

b) $\frac{10}{3}\pi$

c) 5π

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

e) $\frac{15}{2}\pi$

$= \lim_{b\to 1}\left[10\cdot\arcsin x\right]_0^b$

$= \lim_{b\to 1}\left[10\arcsin(b) - 10\arcsin(0)\right]$

$= 10\arcsin(1) - 10\arcsin(0)$

$= 10\cdot\frac{\pi}{4} - 0 = \frac{5}{2}\pi$

I.B.P.

$u \quad dv$

$\ln(x) \quad 2x$

$\frac{1}{x} \quad x^2$

$$\int \frac{8x}{\sqrt{16-x^2}}\,dx = \int \frac{8 \cdot 4\sin\theta \cdot \cancel{4\cos\theta}}{\cancel{4\cos\theta}}\,d\theta = 32\int \sin\theta\, d\theta$$

$$= -32\cos\theta + C$$

$$= -32\frac{\sqrt{16-x^2}}{4} + C$$

Let $x = 4\sin\theta$

$dx = 4\cos\theta\, d\theta$

4, x, θ, $\sqrt{16-x^2}$

Question 14

You did not answer the question.

Evaluate the improper integral.

$$\int_0^4 \frac{8x}{\sqrt{16-x^2}}\,dx = \lim_{b\to 4}\left[\int_0^b \frac{8x}{\sqrt{16-x^2}}\,dx\right]$$

$$= \lim_{b\to 4}\left[-32\frac{\sqrt{16-x^2}}{4}\right]_0^b$$

$$= \lim_{b\to 4}\left[8\sqrt{16} - 8\sqrt{16-b^2}\right]$$

$$= 8\cdot 4 = 32.$$

a) 64

b) 16

c) 32

d) *diverges*

e) 48

Question 15

You did not answer the question.

Evaluate the improper integral.

$$\int_{e^2}^{\infty} \frac{6\ln(x)}{x}\,dx = \lim_{b\to\infty}\left[\int_{e^2}^{b} \frac{6\ln(x)}{x}\,dx\right]$$

$$= \lim_{b\to\infty}\left[6\cdot\frac{(\ln(x))^2}{2}\right]_{e^2}^{b}$$

$$= \lim_{b\to\infty}\left[\underbrace{3(\ln(b))^2}_{\text{Diverges.}} - \underbrace{3(\ln(e^2))^2}_{\text{fixed}}\right] \Rightarrow \text{Diverges}$$

a) 6

b) 4

c) 12

d) *diverges*

e) 2

Question 16

You did not answer the question.

Evaluate the improper integral.

$$\int_0^1 2x\ln(x)\,dx = \lim_{a\to 0}\left[\int_a^1 2x\ln(x)\,dx\right]$$

$$= \lim_{a\to 0}\left[x^2\ln(x)\Big|_a^1 - \int_a^1 x\,dx\right]$$

$$= \lim_{a\to 0}\left[\cancel{1\cdot\ln 1} - a^2\ln a - \left(\frac{x^2}{2}\right)\Big|_a^1\right]$$

$$= \lim_{a\to 0}\left[\underbrace{-a^2\ln a}_{(0\cdot\infty)} - \frac{1}{2} + \frac{a^2}{2}\right] = -\frac{1}{2}$$

by L'HOPITAL 0 as $a \to 0$

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

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

c) *diverges*

d) $-\frac{1}{2}$

e) -1

Question 17

You did not answer the question.

$\frac{17}{x^2}$ is symmetric

Evaluate the improper integral.

$$\int_{-\infty}^{\infty} \frac{17}{x^2}\,dx = 2\int_0^{\infty} \frac{17}{x^2}\,dx$$

$$= 2\lim_{b\to\infty}\lim_{a\to 0}\left[\int_a^b \frac{17}{x^2}\,dx\right]$$

$$= 2\cdot\lim_{b\to\infty}\lim_{a\to 0}\left[-\frac{17}{x}\right]_a^b$$

$$= 2\lim_{b\to\infty}\lim_{a\to 0}\left[\underbrace{-\frac{17}{b}}_{0} + \underbrace{\frac{17}{a}}_{\text{Diverge}}\right] \Rightarrow \text{Diverges}$$

a) -17

b) 34

c) $\sqrt{17}$

d) *diverges*

e) 17

Question 18

You did not answer the question.

Evaluate the improper integral.

$$\int_{\frac{1}{3}}^{3} \frac{10}{(3x-1)^{1/3}}\,dx$$

$$\int_{\frac{1}{3}}^{3} \frac{10}{(3x-1)^{\frac{1}{3}}}\,dx = \lim_{a\to\frac{1}{3}}\left[\int_a^3 \frac{10}{(3x-1)^{\frac{1}{3}}}\,dx\right]$$

$$= \lim_{a\to\frac{1}{3}}\left[10\cdot\frac{3}{2}\cdot\frac{1}{3}(3x-1)^{\frac{2}{3}}\right]_a^3$$

a) 30

b) $\frac{40}{3}$

$$= \lim_{a\to\frac{1}{3}}\left[5(3x-1)^{\frac{2}{3}}\right]_a^3 = \lim_{a\to\frac{1}{3}}\left[5\cdot 8^{\frac{2}{3}} - 5(3a-1)^{\frac{2}{3}}\right]$$

c) *diverges*

d) 20

$$= 5\cdot 2^2 - 0 = 20$$

e) 40

b) $\frac{28}{3}$

c) 14

d) *diverges*

e) 21

Question 19

You did not answer the question.

Evaluate the improper integral.

$$\frac{1}{x^2-4} = \frac{1}{(x-2)(x+2)} = \frac{\frac{1}{4}}{(x-2)} + \frac{-\frac{1}{4}}{(x+2)}$$

$$\int_{-3}^{2} \frac{1}{x^2-4}\,dx = \int_{-3}^{-2} \frac{1}{x^2-4}\,dx + \int_{-2}^{2} \frac{1}{x^2-4}\,dx$$

Diverges

$$\int_{-3}^{-2} \frac{dx}{x^2-4} = \int_{-3}^{-2} \frac{-\frac{1}{4}}{x+2} + \frac{\frac{1}{4}}{x-2}\,dx$$

a) 1

b) 4

c) *diverges*

$$\lim_{b\to-2}\left[\int_{-3}^{b} \frac{-\frac{1}{4}}{x+2}\,dx\right] = \lim_{b\to-2}\left[-\frac{1}{4}\ln|x+2|\right]_{-3}^{b}$$

d) −6

e) 2

$$= \lim_{b\to-2}\left[-\frac{1}{4}\ln|b+2| + \frac{1}{4}\ln|-1|\right] \to \text{Diverge}$$

Diverg

Question 20

You did not answer the question.

Evaluate the improper integral.

$$\int_0^{\frac{1}{2}\pi} \frac{7\cos(x)}{\sqrt{\sin(x)}}\,dx = \lim_{a\to 0}\left[\int_a^{\frac{\pi}{2}} \frac{7\cos(x)}{\sqrt{\sin(x)}}\,dx\right]$$

a) 7

$$= \lim_{a\to 0}\left[7\cdot 2\sqrt{\sin(x)}\right]_a^{\frac{\pi}{2}} = \lim_{a\to 0}\left[14\sqrt{\sin(\tfrac{\pi}{2})} - 14\sqrt{\sin(a)}\right]$$

$$= 14\cdot\sqrt{1} - 0 = 14$$