- It is easy to show that the function $y = \frac{5x + 3}{x 4}$ has an inverse. What is it? 1.
- (A) $y = \frac{x-4}{5x+3}$ (B) $y = \frac{4x-1}{3x+5}$ (C) $y = \frac{3x-5}{4x+1}$

 - (D) $y = \frac{4x + 3}{x 5}$ (E) $y = \frac{5x 3}{x + 4}$

- Suppose that f and g are increasing functions with domain and range $(-\infty, \infty)$. 2. How many of the following functions must be one-to-one?

 - i) f + g ii) fg iii) $\frac{f}{g}$ iv) fog

- (A) 4 (B) 1 (C) 2 (D) 0(E) 3

- It is easy to see that the function $f(x) = x + \sqrt{x}$ has an inverse function g(x). 3. Find g'(2).

- (A) $\frac{2}{3}$ (B) $\frac{1}{1+2\sqrt{2}}$ (C) $\frac{1}{2}$ (D) $\frac{2\sqrt{2}}{1+2\sqrt{2}}$ (E) $\frac{4}{5}$

How many of the following are true? 4.

i)
$$\ln \frac{1}{3} = \int_{3}^{1} \frac{1}{t} dt$$

ii)
$$e^{-x} < 0$$
 for all x

iii)
$$2^{\pi} = e^{2 \ln \pi}$$

iv) $log_4 x = 2 log_2 x$

- (A) 0

- (B) 3 (C) 2 (D) 1(E) 4

5. If
$$y = \sqrt{\frac{(x^4 + 1)(x^3 + 1)}{(x^2 + 1)(x + 1)}}$$
, then $\frac{dy}{dx}\Big|_{x = 1} = ?$

- (A) $\sqrt{6}$
- (B) 1 (C) $\sqrt{\frac{7}{3}}$ (D) $\frac{1}{2}$ (E) $\sqrt{3}$

Suppose the populations of two countries are growing exponentially. Suppose 6. also that one country has a population of 60,000,000 and a doubling time of

20 years whereas the other has a population of 20,000,000 and a doubling time of 10 years. Approximately how long (in years) will it be until the two countries have the same population?

(B)
$$10 \frac{\ln(\frac{3}{2})}{\ln 2}$$
 (C) $\frac{3}{2} \ln 2$

(C)
$$\frac{3}{2}$$
 ln 2

(D)
$$2 \ln \left(\frac{3}{2}\right)$$
 (E) $20 \frac{\ln 3}{\ln 2}$

(E)
$$20 \frac{\ln 3}{\ln 2}$$

7.
$$\lim_{X \varnothing 1} \frac{\ln x - x + 1}{x^3 - 3x + 2} = ?$$

(A)
$$-\frac{1}{6}$$

(A)
$$-\frac{1}{6}$$
 (B) $0(C) -\frac{1}{2}$ (D) $\frac{1}{3}$

(D)
$$\frac{1}{3}$$

8. If
$$f(x) = x^{\ln x}$$
, then $f'(e) = ?$

(A) 1 (B)
$$\frac{1}{e}$$

9.
$$\int_{0}^{2} \frac{1}{1 + (x - 1)^{2}} dx = ?$$

(A)
$$1(B) \frac{\sqrt{3}}{2}$$
 (C) $\frac{1}{\sqrt{2}}$ (D) $\frac{1}{2}$ (E) $\frac{\pi}{2}$

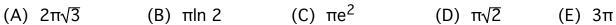
(C)
$$\frac{1}{\sqrt{2}}$$

(D)
$$\frac{1}{2}$$

(E)
$$\frac{\pi}{2}$$

The region between the curve $y = \sqrt{\cot x}$ and the x – axis from x 10. $=\frac{\pi}{6}$ to $x=\frac{\pi}{2}$ is revolved about the x-axis to generate a solid.

The volume of the solid is



- 11. A ladder 10ft. long leans against a vertical wall. If the bottom of the ladder slides away from the base of the wall at a speed of 2ft/sec, how fast is the angle between the ladder and the wall changing (in radians/sec) when the bottom of the ladder is 6 ft. from the base of the wall?

(A) $\frac{1}{4}$ (B) $\frac{3}{5}$ (C) $\frac{5}{6}$ (D) $\frac{1}{5}$ (E) $\frac{1}{3}$