Name _____

1. The derivative of $f(x) = \sec x$ at $x = \frac{\pi}{6}$ is

A. $\frac{2}{3}$

B. $\frac{2}{\sqrt{3}}$

C. $\frac{4}{3}$

D. 2

E. 4

2. $\lim_{x \to 0} \frac{1}{e^{-x}}$ equals

A. $-\infty$

B. -1

C. 0

D. 1

E. ∞

Name _____

3. If $f(x) = \tan^{-1}(\sqrt{x})$ then $f'(3)$ equals

A. $-\frac{1}{4\sqrt{3}}$

B. $\frac{\sqrt{3}}{8}$

C. $\frac{1}{8\sqrt{3}}$

D. $\frac{1}{4}$

E. $\frac{\pi}{3}$

4. The tangent line to the graph of $f(x) = 2\ln(x^2+1)$ at x=1 is

A. $y = x + 2\ln 2 - 1$

B. $y = 2x + 2\ln 2 - 2$

C. $y = 4x + 2\ln 2 - 4$

D. $y = -2x + 2\ln 2 + 2$

E. $y = -x + 2\ln 2 + 1$

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5. If $y^5 - xy^2 + 2x = 3$, then the value of y' when x=2 and y=1 is:

A. -1
B. $-\frac{2}{3}$
C. 0
D. $\frac{2}{5}$
E. $\frac{2}{3}$

6. A particle travels along a line with position $x(t) = 2^t$. The acceleration of the particle at time t=1 is:

A. 2
B. $\frac{2}{\ln 2}$
C. $\frac{2}{(\ln 2)^2}$
D. $2 \ln 2$
E. $2(\ln 2)^2$

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7. The function $f(x) = x^2e^x$ has local extrema as follows:

A. loc max at $x = -2$ and loc min at $x = 0$

B. loc max at $x = 0$ and loc min at $x = -2$

C. local min at $x = -2$ and $x = 0$

D. local max at $x = -2$ and $x = 0$

E. no local max or min

8. The function $f(x) = \dfrac{1+x^2}{1-x^2}$ is increasing on the intervals:

A. $(-\infty, -1)$ and (0,1)

B. $(-1, 0)$ and $(1,\infty)$

C. (0,1) and $(1,\infty)$

D. $(-\infty, -1)$ and $(-1, 0)$

E. $(-\infty, -1)$ and $(1,\infty)$

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9. The function $f(x) = \dfrac{x^2+1}{5x^2-2x}$ has:

A. 2 vertical and 2 horizontal asymptotes

B. 2 vertical and 1 horizontal asymptotes

C. 1 vertical and 2 horizontal asymptotes

D. 1 vertical and 1 horizontal asymptotes

E. 1 vertical and no horizontal asymptotes

10. The function defined by

$f(x) = x^2$ for $x < 0$,

$f(x) = x + 2$ for $0 \leq x \leq 2$, and

$f(x) = 4 + \ln(x-1)$ for $x > 2$

has discontinuities at:

A. no values of x

B. x=0 and x=2 only

C. x=2 only

D. x=0 only

E. x=0 and x=1 only

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11. The function $f(x) = 2x^3 - 3x^2 - 12x$ is concave up on the intervals:

A. $(-\infty, -1)$ and $(2,\infty)$

B. $(-1, 2)$

C. $(-\infty,\frac{1}{2})$

D. $(\frac{1}{2},\infty)$

E. $(-\infty,\infty)$

12. The base of a triangle increases at the rate of 2 in/min while the area increases at the rate of 6 in^2/min. At what rate is the altitude of the triangle changing when the altitude is 2 in and the area is 4 in^2?

A. 1 in/min

B. 2 in/min

C. 3 in/min

D. 4 in/min

E. 6 in/min

13. Estimate $\tan\left(\frac{5\pi}{24}\right)$ using differentials near $a = \frac{\pi}{4}$.

A. $\frac{24-\pi}{24}$

B. $\frac{12-\pi}{12}$

C. $\frac{\pi}{12}$

D. $\frac{-\pi}{12}$

E. $\frac{\pi}{24}$

14. Determine how many critical numbers the function $f(x) = x^7 + 14x$ has.

A. none

B. 1

C. 3

D. 5

E. 6

15. The absolute maximum and minimum values for $f(x) = x^4 - 8x^2 + 1$ on $[-1, 3]$ are respectively

A. $\{10, -15\}$

B. $\{3, 2\}$

C. $\{2, 0\}$

D. $\{1, -15\}$

E. $\{1, -8\}$

16. If $f''(x) = (x+1)^2(x-2)x^3$ then f has inflection points with x values just at

A. $\{-1, 0, 2\}$

B. $\{-1, 2\}$

C. $\{-1\}$

D. $\{0, 2\}$

E. $\{-1, 0\}$

17. Suppose that $f(x)$ is continuous on $[-1, 3]$ and $f'(x)$ exists on $(-1, 3)$ such that $-2 \leq f'(x) \leq 4$. Which one of the following is always true?

A. $f(3) - f(-1) \leq -2$

B. $f(3) - f(-1) \geq -2$

C. $f(3) - f(-1) \leq 4$

D. $f(3) - f(-1) \geq -8$

E. $f(3) - f(-1) \leq 3$

20. If $f(x) = x^4 + x + 2$ and $x_1 = 1$ then x_2 from Newton's method is

A. $\frac{1}{5}$

B. $-\frac{1}{4}$

C. $\frac{4}{5}$

D. $-\frac{1}{5}$

E. $\frac{1}{4}$

21. If $f'(x) = \frac{1}{1+x^2}$ and $f(0) = \frac{\pi}{4}$ then determine $f(1)$.

A. 0

B. $\frac{\pi}{4}$

C. $\frac{\pi}{2}$

D. $\frac{3\pi}{4}$

E. π

22. If $\int_1^2 f(x)dx = 3$, $\int_1^5 f(x)dx = 4$, and $\int_4^5 f(x)dx = 6$, then $\int_2^4 f(x)dx$ equals

A. 0

B. 4

C. 2

D. -2

E. -5

23. If $f(x) = \int_1^x \frac{t^4}{4+t^2}dt$ then $f'(2)$ equals

A. 2

B. 4

C. 6

D. 8

E. 16

24. $\int_1^4 x(5\sqrt{x}+4)dx$ equals

A. 24

B. 36

C. 42

D. 92

E. 108

25. $\int_2^3 \frac{dx}{(2x-3)^2}$ equals

A. $\frac{3}{2}$

B. $\frac{4}{5}$

C. 1

D. $\frac{2}{5}$

E. $\frac{1}{3}$