

- ① If $G(x) = \int_0^x \frac{1}{\sqrt{1-t^2}} dt$, then $G'(0) = ?$
- ② Evaluate
- (a) $\int \frac{dx}{\sqrt{x}(1+\sqrt{x})^2}$
- (b) $\int_0^2 \frac{1}{(x-1)^2} dx$
- ③ Find the area of the region enclosed by $r = 1 + \sin \theta$.
- ④ Solve $\frac{dy}{dt} + 4y = 8$ given $y = 4$ when $t = 0$.
- ⑤ what is sum of $1 + \frac{\pi}{4} + \frac{\pi^2}{16} + \frac{\pi^3}{64} + \dots$?
- ⑥ Evaluate
- (a) $\int_0^4 \frac{x}{\sqrt{x^2+9}} dx$
- (b) $\int x \sin x dx$
- ⑦ Find area of region outside $r = 2 + 2\cos \theta$ + inside $r = 2$.
- ⑧ (a) Find first four non-zero terms of $f(x) = e^{x^4}$ in its Maclaurin series.
 (b) Use that answer from (a) to estimate $\int_0^{1/2} e^{x^4} dx$.

9 Evaluate

(a) $\int \frac{x^2}{x^3+1} dx$

(b) $\int x e^{-2x} dx$

(c) $\int_0^{\pi} (\sin \theta + \cos \theta) d\theta$

(d) $\int x^2 e^{x^3} dx$

(e) $\int \frac{x+1}{x(x-1)(x^2+1)} dx$

10 For a new radioactive substance, it is found that after 10 yrs 5% of the substance has decayed. Find the half life of the substance.

11 Find the convergence set for $\sum_{n=1}^{\infty} \frac{(x-3)^n}{n!}$.

12 Does $\sum_{n=1}^{\infty} \frac{n^2 3^{n+1}}{e^{2n}}$ converge or diverge?

13 Find a power series for $F(x) = \int x e^{x^3} dx$.

14 Find $\frac{dy}{dx}$.

(a) $y = \frac{\ln(3x+1)}{\cos(\sqrt{x})}$

(14) (cont)

$$(b) y = (x^2 + x)^{1+x}$$

(15) Solve $\frac{dy}{dx} = \frac{x^3 - 4y}{x}$ given $y = \frac{8}{7}$ when $x = 1$.

(16) Evaluate

$$(a) \int \frac{\sqrt{4x^2 + 9}}{x^4} dx$$

$$(b) \int_2^4 \frac{dx}{\sqrt{x-2}}$$

$$(c) \int_0^{\pi/3} x \cos(3x) dx$$

$$(d) \int \frac{2x+3}{x^3+x} dx$$

$$(e) \int \cos^3(x) dx$$

$$(f) \int_{-\infty}^0 8x^2 e^{-x^3} dx$$

$$(g) \int_0^1 \frac{4y}{\sqrt{y^2+6}} dy$$

(17) Find the limit, if it exists.

$$(a) \lim_{x \rightarrow 0} \frac{5 \sin(5x)}{\tan(4x)}$$

$$(b) \lim_{x \rightarrow \infty} (2x)^{\sqrt[3]{3x}}$$

(18) For $a_n = \frac{5n}{\sqrt{5n^2 - 3}}$ (a) write out first 3 terms of sequence $\{a_n\}$.

(b) Determine if $\{a_n\}$ converges or diverges. If it converges, find its limit.

(19) Determine if each series is absolutely convergent, conditionally convergent, or divergent

$$(a) \sum_{n=1}^{\infty} \frac{\sqrt{3n}}{n^3 + 5}$$

$$(b) \sum_{n=1}^{\infty} \frac{n-2}{4n-1}$$

$$(c) \sum_{n=1}^{\infty} \frac{n^4 (-3)^n}{(n+2)!}$$

(20) Find a power series that represents $f(x) = \frac{1}{1-2x} + e^{-3x}$ $\forall |x| < \frac{1}{2}$. (Write out terms to x^4 term.)

(5)

(21) For $f(x) = \frac{1}{3+x}$

(a) Find the Taylor polynomial of order 3 centered at $a=2$.

(b) Approximate $f(2.3)$ using your Taylor polynomial.

(c) Find a bound for the error in your approximation.

(22) For Cartesian coords $(-3\sqrt{3}, 3)$, find three different ways to represent this point in polar coordinates.

(23) Find the slope of the tangent line to $r = 2 + 3\sin\theta$ at $\theta = \pi/4$.

(24) For $x^2 + (y-2)^2 = 4$

(a) find polar equation for this curve.

(b) Find the area of the region bounded by your polar equation curve.